An MDM PUBLICATION
Issue 13 – March 2005

APF

ASIA PACIFIC FIRE MAGAZINE

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REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

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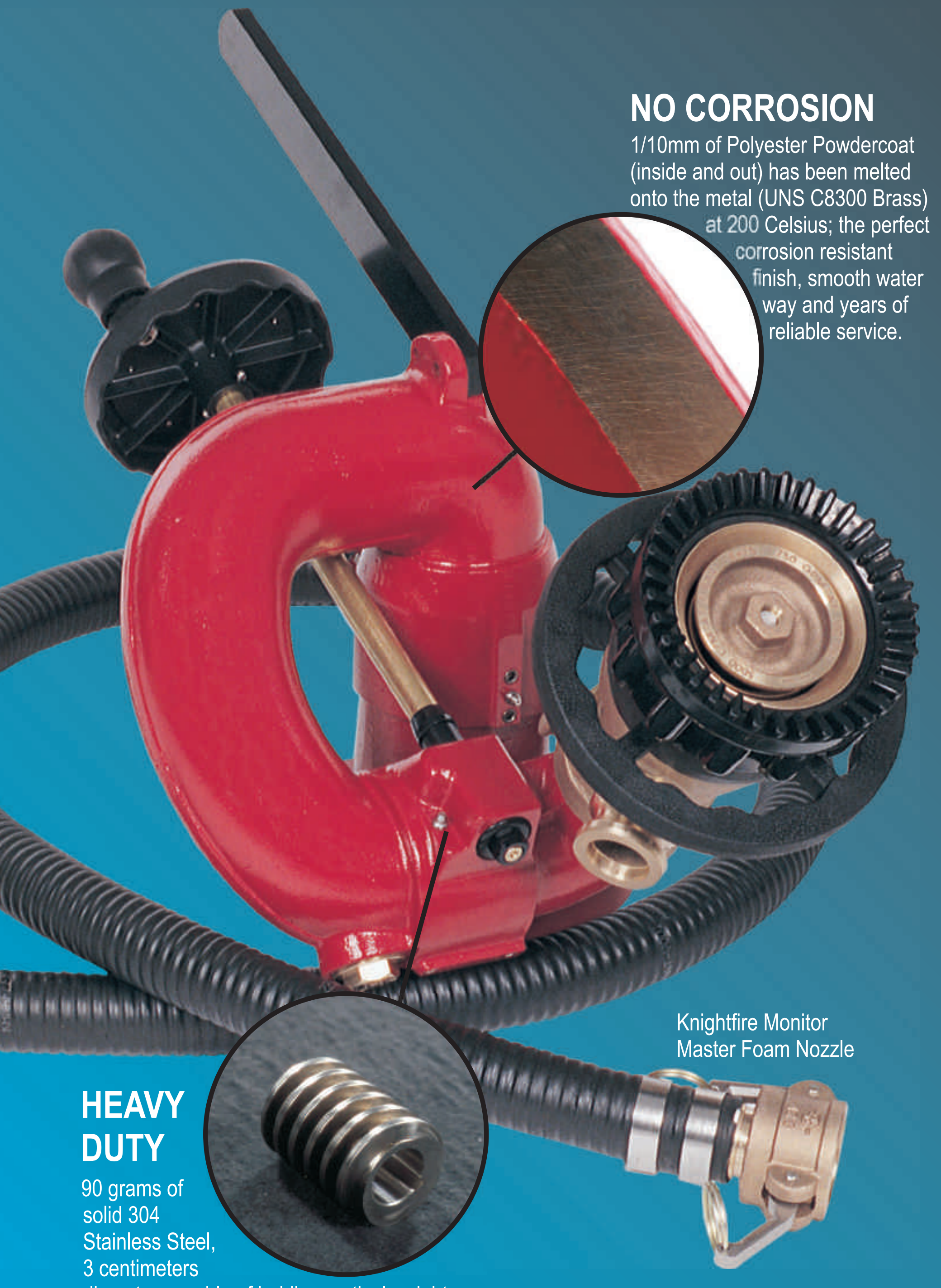

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Front cover picture: Fireman cut Steel Barriers during a Rescue Drill in Seoul, South Korea. Picture courtesy of REUTERS/Kim Kyung-Hoon

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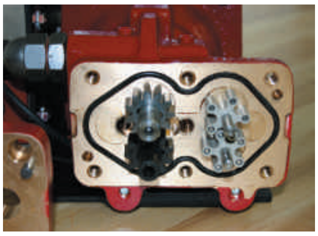

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FOREWORD

by Jeff Godfredson

NFPA's Asia-Pacific Operations Director

TSUNAMI DISASTER

On behalf of all involved with APF Magazine we would like to express our sadness for all of those involved in the tragic events, which unfolded on the 26th December 2004. Our thoughts are with all of those who lost family members, friends, livelihoods and possessions. We hope the worldwide effort currently underway can ease their suffering.

Jeff Godfredson
NFPA's Asia-Pacific Operations Director

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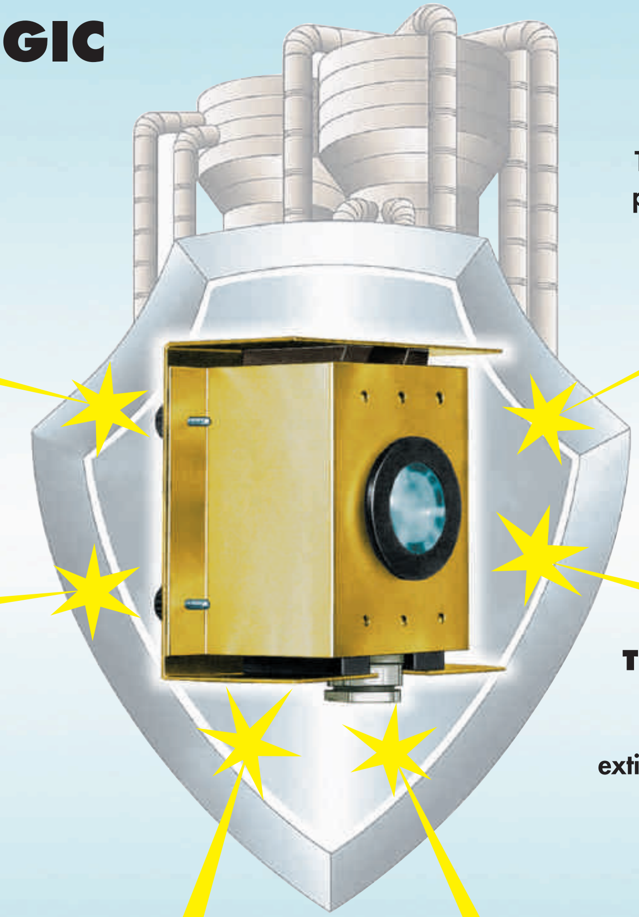

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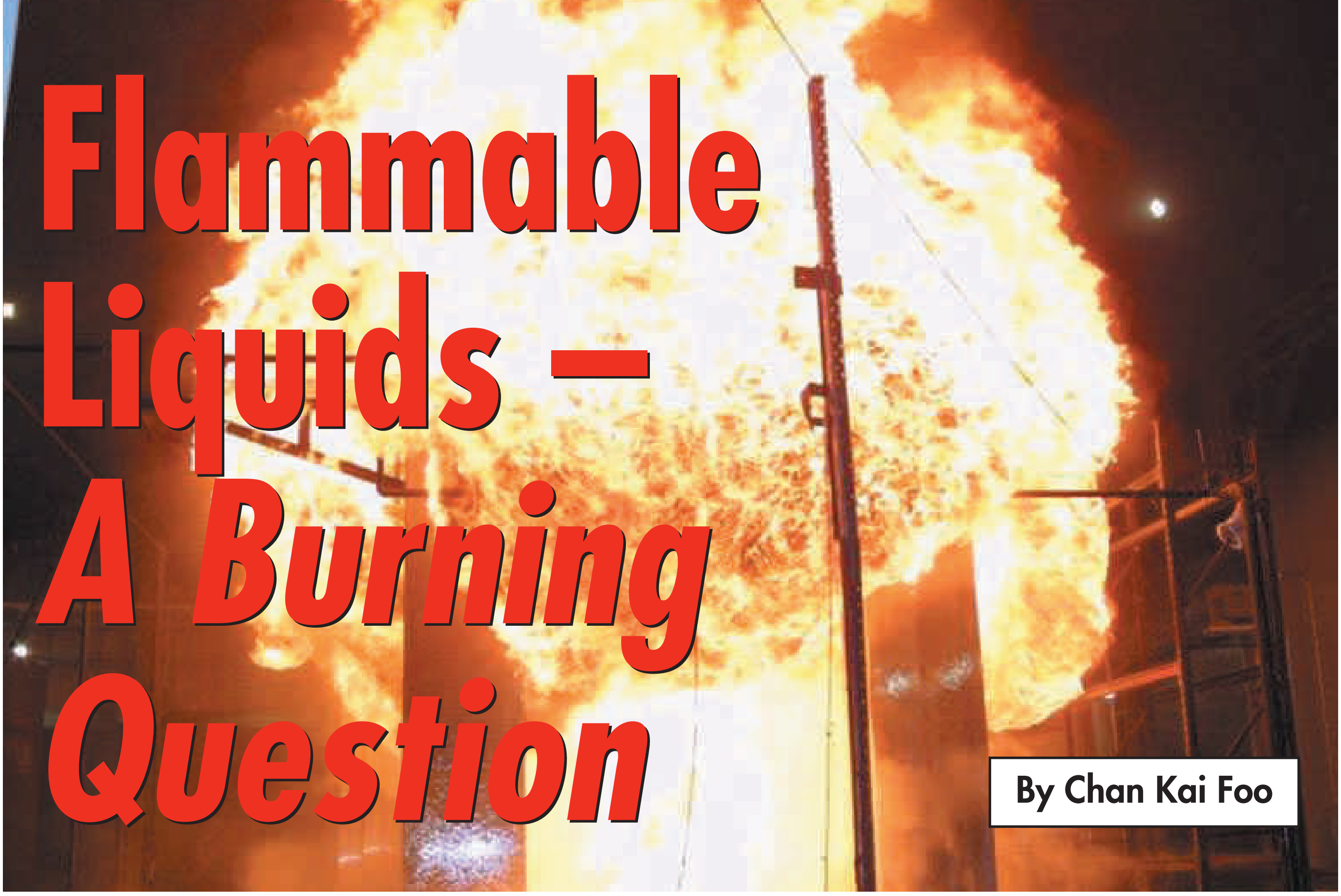
Flammable Liquids – A Burning Question



By Chan Kai Foo

A cut-off room dedicated for flammable liquid dispensing

MANY FACILITIES HAVE FLAMMABLE liquids on site as part of their normal operations. They are used to supply production needs such as heating processes, powering hydraulic equipment, feeding printing presses or lubricating equipment. They are also used directly as a component of a manufacturing process. Flammable liquid is an everyday presence in today's industry.

UNDERSTANDING THE HAZARD

Flammable liquids can present a particularly dangerous hazard. They have vapors that are not only invisible but easy to ignite. Flammable liquids are normally kept in closed containers or transfer systems to prevent vapor release. If exposed to the atmosphere, some emit vapors at room temperature while others have to be heated. If they are put under pressure and then released through leaks in a system, they can atomize, lowering the temperature needed for ignition. If they spill by accident, they cover a large area and can be ignited by common ignition sources like electrical sparks, static or open flames such as pilot lights or even hot work. In short, none of the above parameters are unusual. They are likely to exist in many facilities.

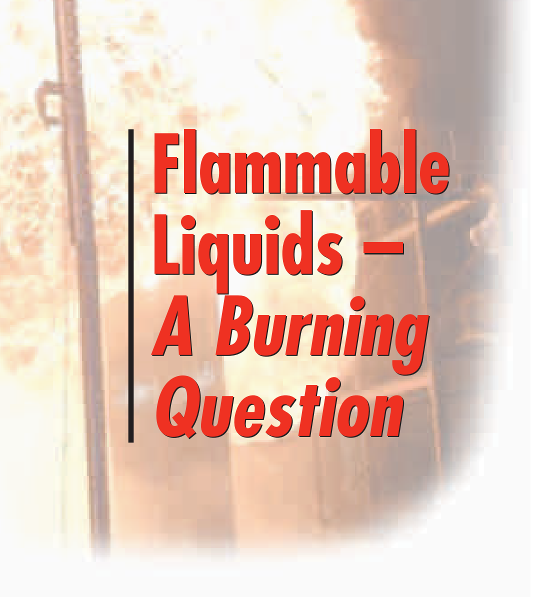
Flammable liquids burn more quickly than combustible solids because they vaporize more readily. Flammable liquids usually have a high heat of combustion, meaning they have the potential to release a great deal of heat when burned. Below is a comparison of the heat of combustion of some common materials and some flammable liquids.

Even though some flammable liquids have a lower heat of combustion than plastic, they still present a greater fire hazard due to the rate at which they release energy in a fire. A fuel's heat release rate is a function of its heat of combustion, the quantity of fuel consumed in a given time, and its exposed surface area. Because flammable liquids are fluid, they spread out, creating a larger surface area for burning than would be available in a solid. This larger burning surface area generates heat at a faster rate, increasing the chance the fire will ignite nearby combustibles and produce a large, fast-growing fire. For example, a 30 litre gasoline spill can create a 2.4 m diameter pool (assuming a 6 mm depth). A burning pool of this size can produce flames as high as 11.5 m. If a flammable liquid's flash point is below ambient temperature, the amount of water needed to cool the fuel to the point of extinguishment is very high. Ordinary ceiling sprinklers alone will be ineffective because water droplets will be vaporized by heat rising from the fire before they can reach the fuel surface and cool it.

Materials		Heat of Combustion (kJ/g)
Solids	Wood	19
	Paper	19
	Plastic	28-47
Liquids	Acetone	31
	Fuel oil	44
	Gasoline	48

If vapors from a flammable liquid are released from a container and are allowed to mix in the right concentration with air within an enclosed space, such as a room, an explosion can occur. A liquid's flammable or explosive range describes the concentration of vapor and air required for a fire or explosion.

Prevention and control measures can reduce the frequency of flammable



Flammable Liquids – *A Burning Question*

liquid operations losses and limit potential damage. If equipment safeguards and automatic sprinklers are provided as needed and employees handle flammable liquids safely, losses typically can be kept smaller and less frequent. One can reduce this facility hazard to an acceptable level of risk. FM Global clients have experienced 707 flammable liquid fires over a recent 10-year period, causing nearly US$700 million in damages. These incidents averaged nearly US$1 million each.

Failure to provide adequate protection for flammable liquids can result in catastrophic damage to a facility

PREVENTIVE MEASURES

The best protection against flammable liquid fires is to eliminate the fuel source (for example, by substituting less flammable liquids). If the fuel cannot be eliminated, the following guidelines can help prevent a potential fire:

- Process equipment should be designed to prevent liquid or vapor escape. As far as possible, tanks and vats should be designed to be closed during normal operation and to resist failure when exposed to fire. Open tanks should be provided with automatic-closing covers. Personnel should be provided with the equipment (e.g. safety cans and pumps) and training they need to safely handle flammable liquids.
- A properly designed low-level ventilation system will sufficiently dilute the flammable vapor with air to prevent the concentration from reaching the lower explosive limit
- Ignition sources should be eliminated. This includes providing bonding and grounding straps as well as using intrinsically safe electrical equipment.

CONTROL MEASURES

The following control measures can minimize damage in the event of a liquid release or fire.

- As far as possible locate flammable liquid storages and operations in structures detached from the main building. If unavoidable, locate them in well cut-off rooms (preferably along outside walls) using fire rated masonry construction. When there is an explosion potential, damage-limiting construction can limit damage to other areas of the facility.
- Automatic sprinkler protection is the first line of defense for controlling temperatures in a flammable liquid fire. Automatic sprinklers cool the area to prevent structural and equipment damage, and they extinguish fires that involve high flash point liquids.

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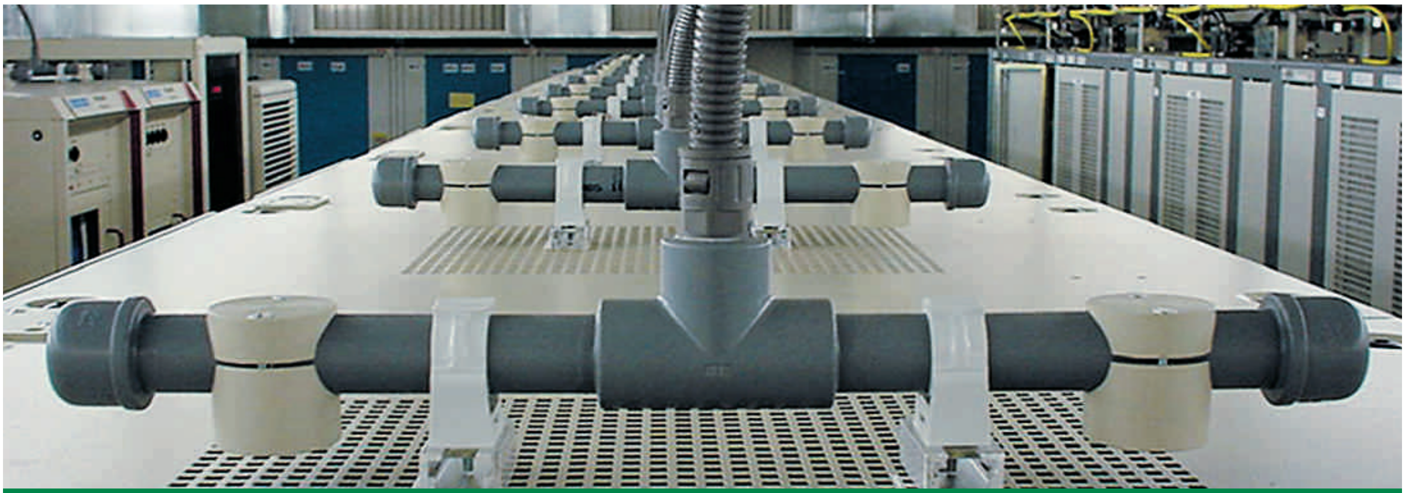

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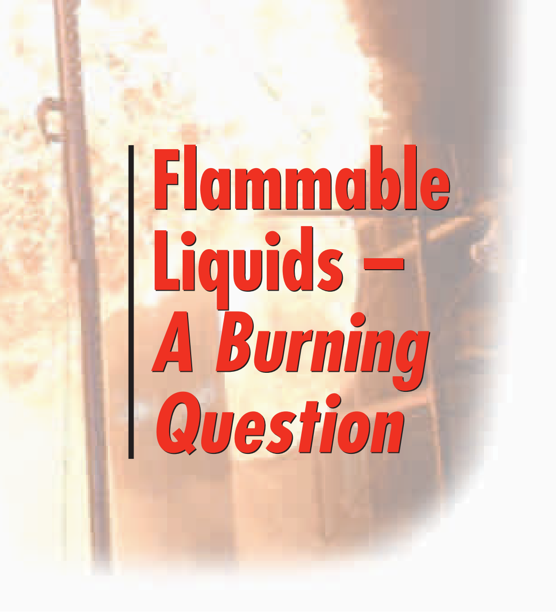

Flammable Liquids – A Burning Question

- Drainage and containment protect the building by controlling and removing the fuel, and protect the environment by controlling the released liquid and sprinkler discharge. Without drainage and/or containment, burning fuel spreads inside the building and contaminated water is released to the environment.

FREQUENTLY DISCUSSED ISSUES

a) Flammable Liquid Classification and High Flash Point Liquids

Everyone has different ways of dealing with liquid that burns. The National Fire Protection Association (NFPA) has developed an extensive classification system based on a liquid's flash point. The flash point of a flammable liquid is the lowest temperature at which it ignites in air when exposed to a flame. Liquids with a flash point of less than 100ºF (38ºC) are considered flammable. The US Department of Transportation (DOT), on the other hand, defines a flammable liquid at less than 141ºF (61ºC). As a result, these differences in flammability classifications make it very difficult for end users (Property & Business Owners, Design Consultants, Building Inspectors, Fire Service Personnel etc) to define the liquid on hand and how to properly manage them. For example the DOT does not require containers with liquids that have flash point of more than 141ºF (38ºC) to be labeled. So it is possible for someone to not know he has a liquid that can burn down a building because this liquid has been classified as combustible rather than flammable.

The loss experience of FM Global clients points to many large losses involving materials with high flash points, such as heat transfer fluids, cutting oils and mineral oil-based hydraulic fluids. When heated above their flash points or pressurized, these materials can be just as dangerous as those with low flash points and additional protection measures are needed.

From a storage stand point, all liquids consisting of non-polar hydrocarbon burns about the same and would require the same protection unless there are properties associated with the liquid that would make the fire protection more effective. Liquids with flash points of more than 200ºF (93ºC) can be extinguished by using ceiling only sprinklers. If the flash point is under 200ºF (93ºC), the sprinkler will not extinguish the fire.

> *From a storage stand point, all liquids consisting of non-polar hydrocarbon burns about the same and would require the same protection unless there are properties associated with the liquid that would make the fire protection more effective.*

There is still a lot that no one knows about protecting flammable liquids. The industry's traditional classification system often confuses more than they inform. FM Global recommends to their clients to not just rely on classification schemes to guide them in storing and handling flammable liquids. If they have a liquid that will burn, they should consider it flammable and protect accordingly.

b) Impact on Production

Some people feel that safe handling procedures "slow down" operations. But nothing slows down operations as much as a major loss. Well-designed safeguards, combined with training, should not significantly decrease productivity.

c) 'Small' Amounts of Flammable Liquids

If a 20 litre container of flammable liquid spills, there is a chance it can be ignited by a spark or another ignition source. But, the size of the fire is not limited to the size of the spill. As the burning liquid spreads, it can ignite nearby combustibles, creating an even larger fire.

d) Sprinkler Protection of Tank Supports

Tanks or vats of flammable liquids supported on steel beams or legs require sprinkler protection below the tank or vat to protect the supports. Heat from a fire could weaken the exposed steel, and may lead to the collapse of the tank, spreading fire far beyond the protection limits of ceiling-level sprinklers. If the tank is wider than 90 cm, ceiling-level sprinklers will have a very hard time reaching the shielded fire below it. Another solution is to encase the leg in concrete or other fire-proofing material to allow it to withstand fire exposure.

e) Automatic shutoffs

If a fire develops in a flammable liquid-handling area, one of the most important control measures is to eliminate additional fuel for the fire. Automatic shutoffs tied into water flow alarms or heat detectors ensure the fuel will be shut off without the risk of employees trying to re-enter the area to do so manually.

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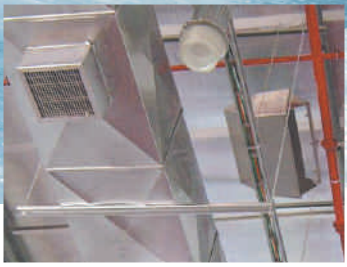

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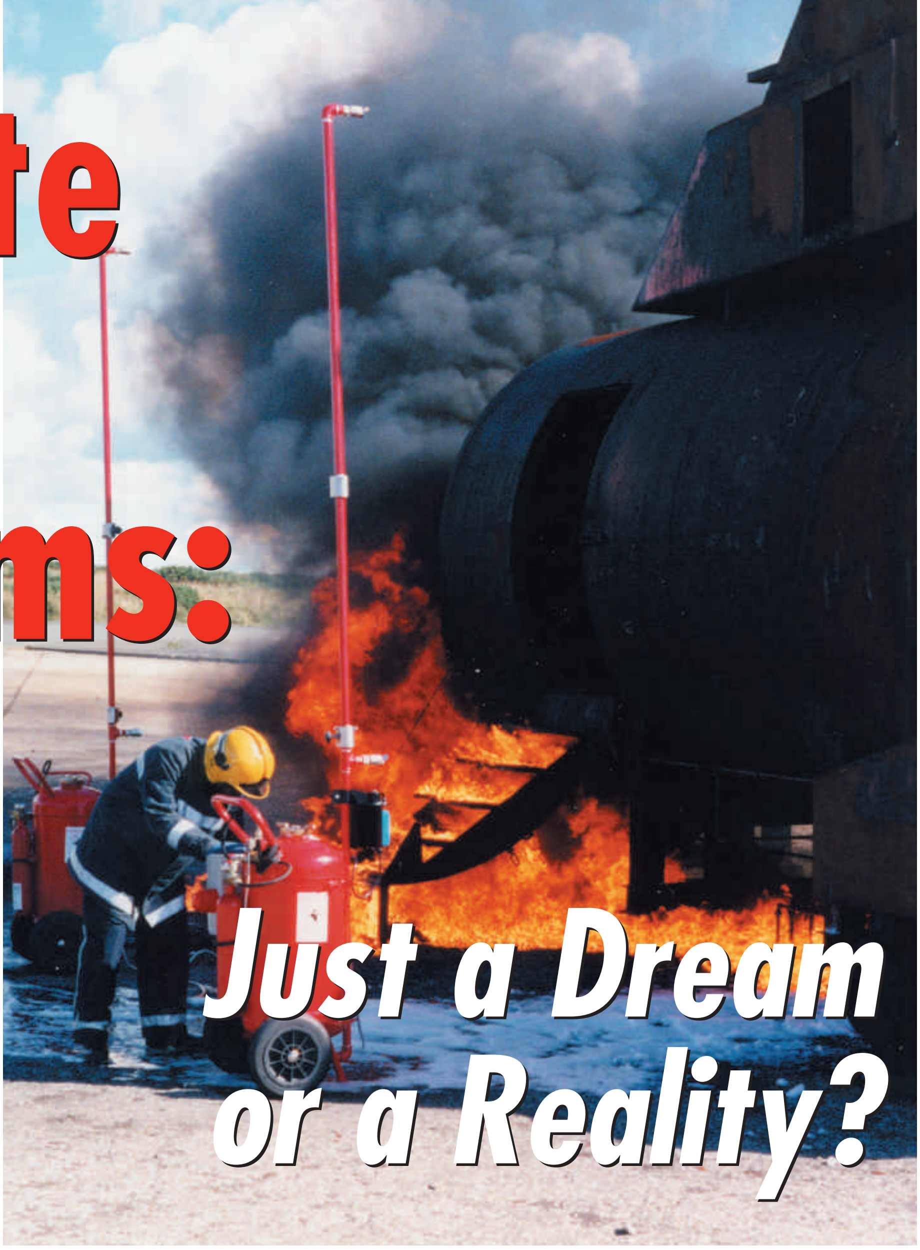
Remote Foam Systems:

Just a Dream or a Reality?

By Mike Willson of Angus Fire



Picture courtesy of Angus Fire

HOW OFTEN DO WE find small flammable liquid hazards lurking on remote sites where there are no water or power supplies connected? The answer is more often than you think with so many hazards in remoter areas like diesel driven generators; fuel, water and waste pumping stations; fuel driven refrigeration units; remote distribution warehouses; workshops and laboratories; flammable liquid stores; boiler rooms; transformers and substations; even light aircraft, executive jets and their hangars; not to mention landing strips and temporary or rented military sites – the list just goes on!

Rarely do such small sites have any pressurised water supplies or electrical connections that could be used in a fire emergency to minimise escalation or damage to the whole installation, particularly in more remote areas.

The cost of providing such an infrastructure on these small sites is quite high and generally outweighs the benefits of providing the required levels of fire detection and protection. On top of this are the additional costs of the specialised equipment needed and their installation into a reliable fixed system. As a consequence many of these sites are not protected against fire when they really should be.

ESCALATION RISK INCREASES ON REMOTE SITES

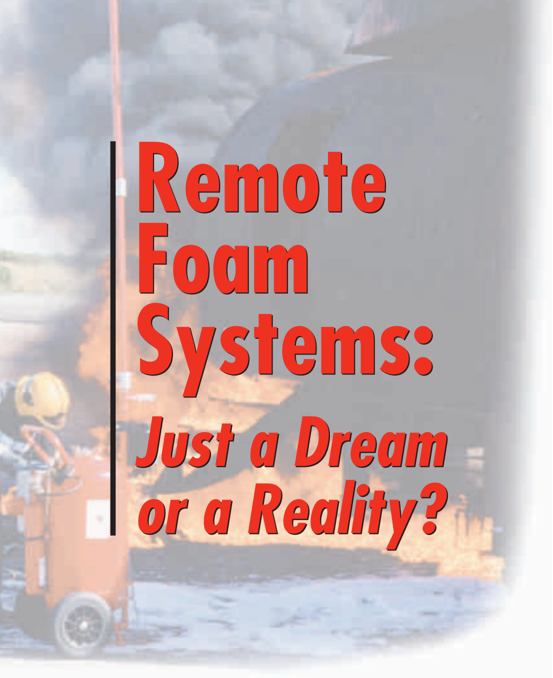
If fire strikes on a remote site and there is no detection, alarm or fire protection ready to take action the whole site is likely to be lost or severely disabled. Many operators choose to rely on rural fire departments to respond quickly and extinguish any fire that may occur. Trouble is, those rural fire department response times are generally slower. This can be due in part to volunteer fire-fighters who have to get to the fire truck from other jobs before they leave the fire station, and longer distances to travel to the incident often along narrow roads or tracks where navigation can also be more difficult, so valuable time can be inadvertently lost in taking control of the fire.

As with any fire, action taken when still small usually allows control to be achieved – but the longer it goes on burning unchecked, the harder it gets. Also the longer it takes to control and extinguish the consequential losses escalate dramatically with every minute that no action is taken, and can quite quickly run out of control. This is never truer than with remoter locations and the inherent difficulties of gaining rapid and effective action onto the fire.

As a consequence small fires can more easily spread out of control and cause greater damage and disruption than an equivalent sized fire on a larger and more complex site in an industrial park or major chemicals production area.

RELIABLE PNEUMATIC DETECTION AND CONTROL

What is needed is a cost-effective self-contained foam fire detection and protection system. This can now be achieved by using specialised self-contained systems. Round the clock pneumatic detection uses special UV stabilised tubing draped around and



Remote Foam Systems: *Just a Dream or a Reality?*

over the main hazard areas like motors, generators or boilers. This tubing contains Nitrogen gas under pressure, so that when fire starts the tubing softens in the heat or melts, releasing the pent up pressure, which is connected to a pneumatic valve. As the pressure drops so the valve opens to allow the bulk of the gas in the nitrogen cylinder to enter a pressure vessel. These pneumatic control systems have an important additional benefit – they will operate without any electrical power requirements.

FLEXIBLE FOAM DELIVERS FAST KNOCKDOWN AND MINIMAL ENVIRONMENTAL IMPACT

A premixed multipurpose foam solution inside the vessel is simply expelled through a discharge pipe to two compact aspirating K20 foam nozzles strategically located over the hazard to deliver a fan shaped spray of low expansion foam to control the resulting flammable liquid pool fire. Choosing an organic foam that will handle hydrocarbons and polar solvent fuels increases the versatility of the unit and minimises the environmental impact when the foam discharges and may run outside any bunded containment areas.

Although such a self-contained foam system will not deal with any pressurised fuel jets or atomised sprays, it will effectively cover, control and extinguish the biggest problem, which is a pool fire on the ground. This will take the bulk of the radiant heat and flame out of the incident, greatly reducing the risk of escalation and minimising the damage to drive motors and other expensive equipment, so the remote station can be brought back into operation more quickly with the minimum of disruption.

HIGH VALUE ASSETS NEED MORE SOPHISTICATED PROTECTION

However this is not generally sophisticated enough for short-term protection of particularly high valued and moveable assets like executive jets and sensitive military equipment. How would you handle protection of military helicopters coming in for urgent maintenance while fuelled or for short pilot changeover periods, when there are no fire trucks available and the location is essentially unmanned? A pneumatic detection method may be impractical to install or insufficiently sensitive to react to flames which could cause the plane to be permanently grounded within a few seconds unless detected and foam is swiftly applied.

ANSWER LIES IN UV/IR^2 DETECTION AND REMOTE ALARM ALONG TELEPHONE LINE

To overcome this potential limitation, a faster and more sensitive detection system is needed. The ideal solution is a combined ultra violet and twin infra red (UV/IR^2) detector which can activate a pair of pressure vessels to attack the fire from both sides of a small aircraft or helicopter at the same time. Alternatively both units can be positioned along the same side of a larger aircraft and a second pair deployed on the other side for maximum protection. Having such units mounted on wheels enables

Fire – Always prepared for every situation

Thomas Gaulke – FIRE Foto

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Picture courtesy of Angus Fire

them to be quickly and easily moved into the correct position for fast deployment. They can also be quickly transported with the aircraft to provide a high level of protection wherever and whenever the aircraft lands. This sophisticated type of detector will distinguish between real flames and solar reflections, flare or welding by sensing the unique flicker frequency of the flame to minimise the risk of false alarms. Such sensitive detection can sense fire and activate the foam discharge within 7 seconds. It can also be set up to give both audible and visual alarms locally to the hazard as well as a remote alarm down a telephone line to a manned control station. This will reliably indicate when the system has been activated.

Picture courtesy of Angus Fire

RAPID DISCHARGE OF FOAM ESSENTIAL

Clearly rapid foam discharge is needed to control the fire quickly and minimise damage to the high value assets and minimise the risk of spread. Foam discharge within 60 seconds through a high and low level aspirating foam nozzle ensures effective foam application to control the pool fire whilst other emergency personnel can arrive at the scene.

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Extensive field-testing of such a highly effective unit with the UK Ministry of Defence has shown it meets the diverse range of their stringent requirements.

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> Perhaps it is time to reassess your remote station and high value asset protection requirements, *before* fire strikes!

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Synthetic Fire Fighting Foams

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BIO-EX is dedicated to create specific fire fighting foams to answer to an ever-growing demand from its customers for environmentally friendly alternatives. First BIO FOR, the ultimate technology for forest and urban fires, then came ECOPOL, the new fluorine-Free Alcohol-Resistant Foam.

TRADITIONAL FOAMS

The first task for foams will be to extinguish the fire as fire itself can have a devastating effect on environment. It is true to say that AFFF enables a fast extinction, but unfortunately they all contain a high level of fluorinated compounds having a detrimental effect on environment.

A few of them are already banned, but still many others are questioned and scrutinized by scientists to evaluate their toxicity. They are all persistent; they are not biodegradable and accumulate in groundwater without any possible path for natural elimination. Plants, animals and humans could be contaminated for numerous years. Who could say today that these compounds are safe?

THE STANDARDS

Bearing in mind that international standards were made on the performance of existing products at the time of their writing. Today standards are made to evaluate and compare foams against the relative efficiency of AFFF. As a result, foams are qualified depending on their extinction speed following a rule – application rate and method – designed on AFFF characteristics.

Table 2

Test models on heptane fire
Gentle application
Extinction time in seconds

Application rate	3,5	7	10	15	20
ECOPOL 3%	52 s	28 s	17 s	14 s	10 s
AFFF-AR 3%	76 s	36 s	23 s	18 s	14 s

APPLICATION RULES: STUDY

BIO-EX undertook a full study on the relative performance of two foams: ECOPOL and FILMOPOL (AFFF-AR)

Table 1

Tests in EN 1568-3
Heptane fire 4.5 m^2
Application rate 2.5 l/sqm.mn
Extinction time in seconds

Application	GENTLE	FORCEFUL
ECOPOL 3%	120 s	240 s
AFFF-AR 3%	225 s	160 s

At an application rate of 2.5 l/sqm.mn, ECOPOL is the fastest to extinguish in gentle application, burnback time exceed 15 minutes for both products, making them top level according to EN 1568-3 standard.

In gentle application, **ECOPOL extinguishes ALWAYS faster than the AFFF AR,** whatever the application rate is.

Let us compare these two foams

- AFFF-AR, applied according to the standard method for this type of foam: forceful application, application rate 2.5 l/sqm.mn.
- ECOPOL, applied in the most efficient method: gentle application, application rate 3.5 l/sqm.mn.

Say that the fuel pan is a tray of 10 sqm filled with heptane.

AFFF-AR extinguishes in 160 seconds. (*Table 1*)

Foam solution consumption is: 2.5 x 160/60 x 10 = 66.7 litres and makes 2 litres of foam concentrate 3%.

ECOPOL extinguishes in 52 seconds. (*Table 2*)

Foam solution use is: 3.5 x 52/60 x 10 = 30.3 litres, making 0.9 litres of ECOPOL at 3%.

This quick calculation proves that, when using the best available technique, **ECOPOL extinguishes a fire at least twice as fast and with two times less product than the AFFF-AR.**

ECOPOL: the BIO-FOAM

Willing to offer the cleanest solution to its clients, BIO-EX innovates with ECOPOL, the FLUORINE-FREE FOAM.

ECOPOL: Efficiency & Quality

ECOPOL meets EN 1568 §1-2-3-4 and is certified by the German Laboratory Institut Der FeuerWehr, following full testing on real fires. It can be used at Low, Medium and High expansion at 3% on all class B fires.

ECOPOL is warranted 10 years and can be stored between –30°C and +60°C.

ECOPOL: Health & Environment

ECOPOL is formulated on a vegetal surface-active agent.

ECOPOL is totally free of any fluorinated material and is not Persistent, Bio accumulative or Toxic (PBT).

ECOPOL is none irritating for skin and eyes.

ECOPOL is formulated using compounds that are easily and totally biodegradable in naturally occurring materials after dilution in water.

ECOPOL leads the way to the future. It copes with modern problems and provides an answer to all firemen keen on health, safety and environment. Already ECOPOL has been picked up by prestigious clients, confident in our technology.

ECOPOL will not damage our environment: contrarily to fluorine-containing foams, ECOPOL does not pollute ground and water, and does not threaten to introduce persistent compounds in alimentary links.

For more information, please contact:

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Care and Maintenance for Structural Fire Fighting PPE

By Fire Chief David Drainville

SCOPE

THIS DOCUMENT ESTABLISHES USE, care, maintenance and replacement criteria for fire service personal protective equipment worn for structural firefighting but does not apply to specialized protective clothing for proximity firefighting, hazardous material emergencies, or emergency medical operations.

USE

PROTECTIVE COATS – STRUCTURAL

Intended Use: Protective coats are designed and configured to provide limited thermal and physical protection to the upper torso and arms, excluding the hands and head.

Components: Protective coats consist of many components. The following are referenced in this document: outer shell, moisture barrier, thermal barrier, reflective trim, closure systems, and wristlets. All components must be used in accordance with the manufacturer's instructions to provide the designed level of protection.

Limitations of Use: Protective coats must not be kept in direct contact with open flame or molten metal. These protective coats are not designed to provide protection for proximity or fire entry applications, nor from radiological, biological or chemical hazards. Specific, specialized protective clothing (e.g. proximity or impervious chemical suits) should be provided to those firefighters who are expected to operate in situations requiring protection from special hazards.

Donning and Doffing: Manufacturer's instructions should be followed in donning and doffing protective coats.

Interface: Protective coats must interface effectively with protective pants, hoods, SCBA, helmets, and gloves for continuous protection.

PROTECTIVE PANTS – STRUCTURAL

Intended Use: Protective pants are designed and configured to provide limited thermal and physical protection to the lower torso and legs, excluding the feet.

Components: Protective pants consist of many components. The following are referenced in this document: outer shell, moisture barrier, thermal barrier, reflective trim, and closure systems. For the purpose of this document, suspenders are included as accessories of pants. All components must be used in accordance with the manufacturer's instructions to provide the designed level of protection.

Limitations of Use: Protective pants must not be kept in direct contact with flame or molten metal. Protective pants are not designed to provide protection for proximity or fire entry applications, nor from radiological, biological or chemical hazards. Specific, specialized protective clothing (e.g. proximity or impervious chemical suits) should be provided to those firefighters who are expected to operated in situations requiring protection from special hazards.

Donning and Doffing: Manufacturer's instructions should be followed in donning and doffing protective pants.

Interface: Protective pants must interface effectively with protective coats and footwear to provided continuous protection.

CLEANING AND DECONTAMINATION

HEALTH RISKS OF CONTAMINATED PPE: Soiled PPE systems can expose firefighters to toxins and carcinogens that enter the body through ingestion,

Picture courtesy of Lion Apparel

Care and Maintenance for Structura

inhalation, and/or absorption. Repeated small exposures to some contaminants can add up over time and/or cause a synergistic effect resulting in health problems. Only frequent, appropriate cleaning can reduce the amount of contamination in PPE.

Although great emphasis is placed on safety to avoid injury or inhalation hazards while working on the fireground, many of the toxins which lead to health risks are being carried away from the fire scene on personal protective equipment used by the firefighter. The procedures in this chapter are provided so that the health risks experienced away from the fireground can be minimized through the proper and special handling of soiled, contaminated, and/or damaged PPE.

Toxins that a firefighter will come in contact with are found in the soot trapped within the fibers of soiled PPE or absorbed into the PPE materials themselves. Contact with the soiled PPE increases the risk of the toxic contaminants being introduced into the body. Clothing may also be contaminated with significant levels of hazardous chemicals without visible evidence of that contamination.

Picture courtesy of Lion Apparel

Clothing contaminated with blood or other body fluids presents a potential risk of communicable disease being transmitted to the person coming in contact with the contaminated clothing system. This chapter also provides guidelines for the handling and care of PPE having been subjected to this type of contamination.

PROTECTING THE PUBLIC FROM CONTAMINATION: The public should not be exposed at any time to soiled and/or contaminated protective equipment used by emergency response personnel. Extra caution should be practiced to avoid exposing children to soiled protective equipment since they are usually more interested in actually touching and handling the equipment than adults. Children are also less likely to wash off any dirt or soot that they may have picked up from handling the PPE. Under no circumstances should soiled or contaminated personal protective equipment be brought into the home, washed in home laundries, or washed in 'public laundries'.

Reduced Performance Hazards of Contaminated PPE: When clothing or equipment becomes laden with particles and chemicals, other problems are faced in addition to exposure to toxins:

1. Soiled PPE reflects less radiant heat. After materials are saturated with hydrocarbons, they will tend to absorb rather than reflect the radiant heat from the surrounding fire.

2. PPE heavily contaminated with hydrocarbons are more likely to conduct electricity. Thereby increasing the danger when entering a building or vehicle where wiring may still be live.

3. Clothing materials impregnated with oil, grease and hydrocarbon deposits from soot and smoke can ignite and cause sever burns and injuries, even if the materials are normally flame resistant.

Firefighters encounter various chemicals in their normal fire fighting activities even though the number of specialized hazardous materials response teams is growing. Exposures to oils, gasoline, and lubricants may occur around fire station vehicles. During responses, exposures to liquids ranging from pesticides to acids to chemical solvents may occur, knowingly or unknowingly. These contaminants, in addition to being hazardous, can also degrade protective clothing material. For example:

- clothing fabrics may become weakened and tear more easily.
- thread or seam sealing tape may become loose.
- flame retarding or water repelling treatments may be removed.
- reflective trim can become less visible.
- helmet shells/face shields or SCBA masks/visors may pit or craze.
- PPE hardware may become corroded.

CLEANING FREQUENCY

Personal Protective Equipment should be cleaned at least every six months.

PPE should be cleaned as soon as possible after an incident where the equipment has been soiled or exposed to blood or body fluids, tars, resins, paints, acids, or any other hazardous materials.

In normal everyday use, personal protective equipment becomes dirty by absorbing sweat from the wearer and "soils" from the outside environment. General cleaning of PPE removes these substances. PPE can also become contaminated with other substances, principally chemicals, particulates, and biological agents. The removal of these substances is most often referred to as decontamination. In structural fire fighting, both general cleaning and decontamination of PPE are needed on a frequent basis.

PPE should be cleaned regularly to remove the fire ground contaminants before they build up to dangerous levels. Only similar items of PPE should be washed together, and additionally, flame resistant and non-flame resistant garments must be cleaned or decontaminated separately. Further, PPE must be decontaminated when directly exposed to chemicals, blood and body fluids, and other known hazardous contaminants. In many cases, the cleaning and decontamination process can be one and the same.

A cleaning and decontamination Decision Tree is provided (Figure 1) to guide the user on handling contaminated personal protective equipment. Personal protective equipment contaminated by known hazardous materials may require special attention as recommended in the DECONTAMINATION section. It is important to realize that the service life of PPE can potentially be reduced if cleaning is done improperly.

After identifying the type of contami-

l Fire Fighting PPE

nants encountered, follow the steps outline by the decision tree. There are three different types of contamination listed on the decision tree: Contamination Requiring General Cleaning, Contamination Involving Body Fluids, and Contamination Involving Hazardous Materials. The general cleaning guidelines for each of these types of contamination follows.

CONTAMINATION REQUIRING GENERAL CLEANING

Hose down at the fire scene. Scrub gently with a soft bristle brush using a mild detergent and rinse thoroughly. Hosing down immediately after the termination of an emergency can remove substantial amounts of surface contaminants before they have a chance to set in. Avoid unnecessary direct skin contact with contaminated clothing or equipment and wash exposed skin areas as soon as possible to remove contaminants and to prevent spreading to other body parts and/or personnel.

While wearing protective gloves, inspect the PPE for damage and the level of soiling. (Refer to inspection chapter).

Determine the proper cleaning procedure for the protective equipment. Procedures for the following methods are described under Cleaning Instructions: In-house cleaning by Utility Sink or Out of House or Contract Cleaning.

CONTAMINATION INVOLVING BODY FLUIDS

Remove the personal protective equipment from the body.

Isolate and bag the equipment. Observance of universal precautions is recommended.

Determine what type of cleaning procedure is necessary. If acceptable, several cleaning methods are outline under contamination requiring general cleaning.

CONTAMINATION INVOLVING HAZARDOUS MATERIALS

Isolate and bag the equipment.

If possible, identify the contaminant for future reference.

Refer to MSDS, HAZMAT RESPONSE GUIDE, and/or PRODUCT MANUFACTURER to determine proper decontamination procedures.

CLEANING INSTRUCTIONS

IN-HOUSE CLEANING: UTILITY SINK

When using utility sinks, it is expected that the cleaning/agitation will be accomplished by hand. Therefore, hot water temperatures should be set so as not to cause burns to the skin; the recommended hot water temperatures under each utility sink cleaning instruction is 105-115°F. For additional skin protection, especially from contaminants, it is important to wear protective gloves during the cleaning procedure.

The appendices of NFPA 1581, "Fire Department Infection Control Program", and NFPA 1971, "Protective Clothing for Structural Fire Fighting", offer information on cleaning and decontamination.

THINGS TO AVOID IN UTILITY SINK CLEANING

- Chlorine Bleach
- Water temperatures greater than 115°F
- Heavy abrasion and/or scrubbing
- High pH (greater than 10.5)
- Mixing flame resistant and non-flame resistant items
- Mixing non-similar PPE items (e.g. turnouts and station wear)

Hoping for the best

Prepared for the worst

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Care and Maintenance for

CLEANING INSTRUCTIONS – UTILITY SINK

Remove, per the manufacturer's instructions, any helmet components that need to be cleaned separately and/or do not need cleaning. Component examples include: ear covers, winter liners, headbands, suspension straps, and foam-type impact caps. (Foam impact caps should be kept dry and, therefore, should be removed from the helmet shell prior to immersion in water)

Physically remove large encrustments from the outside of the helmet. Consult the helmet manufacturer for approved methods and/or solvents that will not damage the shell material or finish.

Helmet Faceshields

Follow the instructions for helmet shells except use a soft clean cloth in place of a soft bristle brush for scrubbing. No solvents are to be used.

Helmet Impact Caps

Place the impact cap in the sink. Do not submerge in water.

Wipe the inner and outer surfaces with a squeezed sponge using hot 105-115°F water and detergent.

Rinse sparingly with clean water or with rinsed sponge.

Wipe and blot dry all surfaces with a dry clean cloth.

Helmet Suspensions, Headbands, Ear Covers, Etc.

If heavily soiled, pre-treat and soak the desired components per the detergent manufacturer's instructions. Allow time for complete air-drying before re-assembly.

GARMENTS – TURNOUTS, HOODS

Do not overload the utility sink.

If liners are detachable, remove from shell and launder separately.

Pre-treat heavily soiled and/or spotted areas of the garment, if necessary. Soak the garments per the detergent manufacturer's instructions. Remove the garment and drain the soak water.

GLOVES

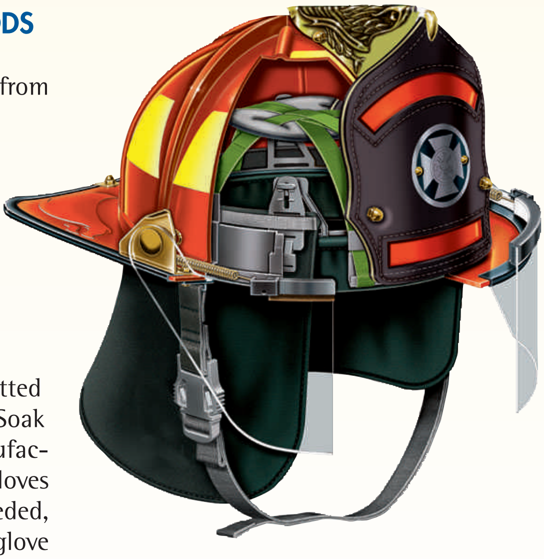
Pre-treat heavily soiled and/or spotted areas of the gloves, if necessary. Soak the gloves per the detergent manufacturer's instructions. Remove the gloves and drain the soak water. If needed, condition the leather per the glove manufacturer's recommendations.

STORAGE

Proper storage of PPE can extend the life of the equipment, maintain performance, and reduce potential health risks. Improper storage will result in damage to the PPE and can compromise the firefighter's safety. NOTE: UV light degradation, especially from sunlight, is the prime cause of "unknown" personal protective equipment failures.

The following conditions may result in the deterioration of PPE performance and/or create potential health hazards:

- Storage in direct sunlight will cause degradation of fibers in protective garments causing fabric strength loss and will accelerate aging of other equipment.
- Storage of wet or moist equipment will promote the growth of mildew and bacteria which can lead to skin irritation, rashes, or more serious medical conditions. Mildew and bacteria growth may also affect the strength of some materials.
- Storage in extreme temperatures for prolonged periods will accelerate deterioration of PPE.
- Storage conditions in abrasive environments and/or in contact with sharp objects will cause mechanical damage.
- Storage in contact with hydraulic fluids, solvents, hydrocarbons, hydrocarbon vapors, or other contaminants can cause material degradation, transfer toxins to the individuals, and reduce the non-burning or self-extinguishing properties of the thermally protective fabrics.
- Storage of PPE in personal living quarters or passenger compartments of vehicles presents a risk to individuals who come into contact with soiled PPE.
- Storage of turnout pants in the collapsed position (on firefighter's day off) can lead to the garment acquiring a "memory" in the fabric which can lead to premature wearing. Such storage also prohibits air flow to the garment which can aid in drying and release of particulates in the fabric.



Picture courtesy of Lion Apparel

The following proper storage practices should be used regardless of storage location which includes warehouses, station, apparatus, and privately owned vehicles. Use of gear bags is highly recommended.

- PPE should be clean and dry before storage.
- The storage area should be clean, dry and well ventilated.
- Keep PPE out of direct sunlight or other sources of UV radiation.
- Avoid exposure to temperature extremes for extended periods.
- Avoid sharp objects during storage.
- Avoid contact with tools, chemicals, and other equipment when storing PPE in compartments.
- Avoid contact of soiled PPE with personal belongings.
- Avoid storage of soiled PPE inside living quarters.
- Avoid storage of soiled PPE within the passenger compartment of vehicles.

INSPECTION

Inspection programs serve two primary purposes. They help to ensure that the firefighter's Personal Protective Equipment will provide its designed protection and it provides a means to document the service and wear life characteristics of the department's PPE. This information is vital in determining the causes (and future prevention) of premature PPE failures and is a powerful tool in developing budget needs and associated justifications.

A systematic and routine top-to-bottom inspection should be made, while wearing protective gloves, on all PPE to confirm its serviceability.

Structural Fire Fighting PPE

Damaged PPE should be immediately removed from use and replaced with serviceable equipment. The decision to repair or retire the damaged PPE should be made by trained personnel. Repaired PPE should be thoroughly inspected before returning it to service.

Inspection Frequency. Inspections should be performed upon receipt of new PPE, at least once a month, after each cleaning, and/or following any application where PPE has been damaged or contaminated. In the event of exposure to hazardous materials, PPE should be isolated and inspected in accordance with the decontamination guidelines.

Inspection Grading Scale. The grading scale is designed to assist fire department personnel in identifying and documenting the condition of all PPE. It helps in evaluating the overall condition of the equipment. Grade definitions are:

- **NEW OR AS-NEW CONDITION:** Newly purchased equipment or equipment that is in like new condition.
- **GOOD CONDITION:** Equipment is in good serviceable condition. The equipment may show wear but replacement is not necessary.
- **IMMEDIATE REPLACEMENT:** Equipment is unsafe and should be removed from service.

  PPE may be repaired or retired after further inspection by trained personnel.
- **GENERAL AREAS OF INSPECTION:** Inspect every article of personal protective equipment for the following types of wear or damage. Soiled PPE should be cleaned before inspection to ensure proper detection of damage such as discoloration and/or heat damage that may be masked. Each of these damage types indicate a potential problem with the protective features of the PPE and apply to all PPE including helmets, boots, gloves, and protective garments.

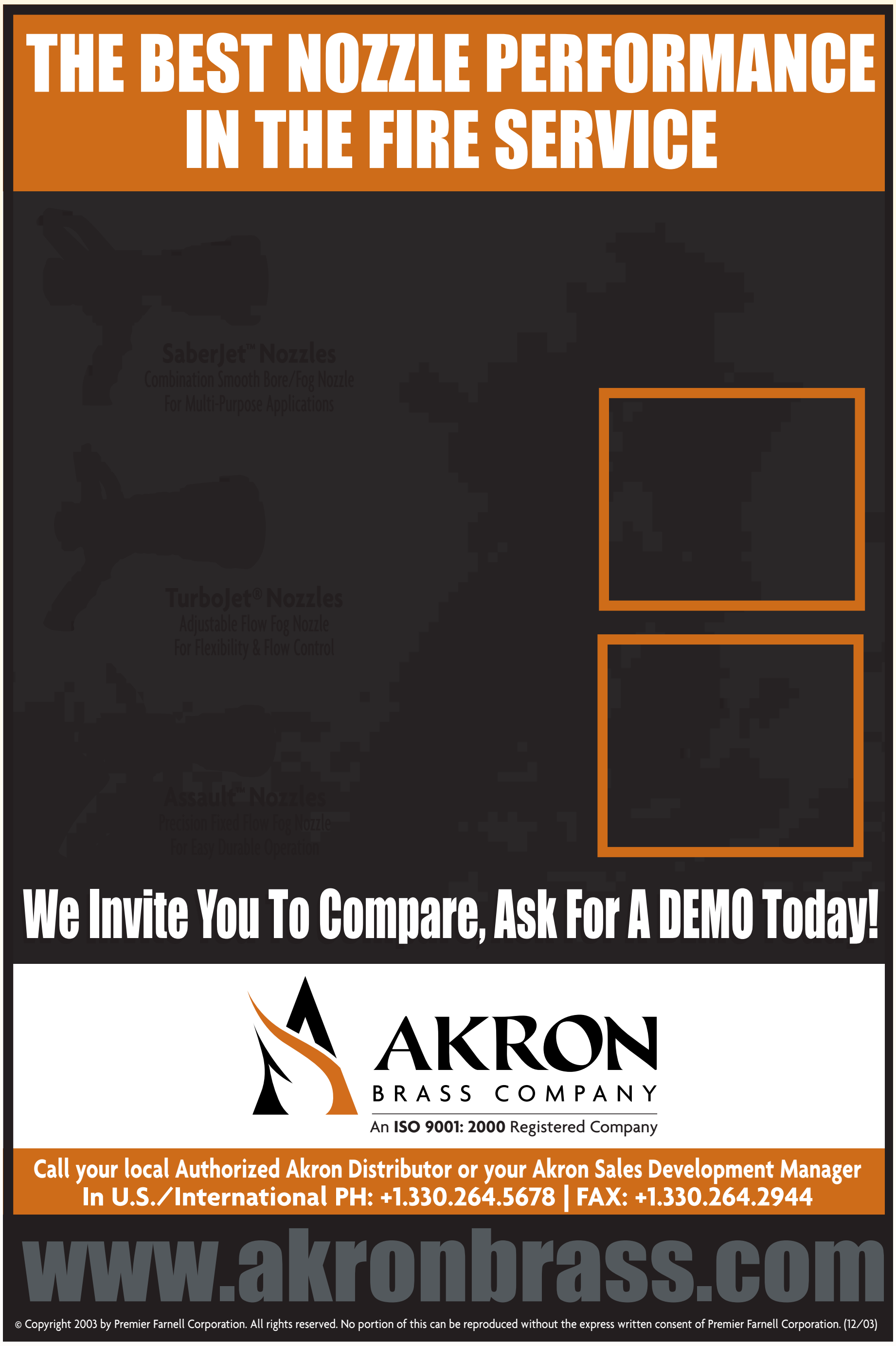
  Cleanliness. Or lack thereof, can indicate contamination of the PPE with foreign substances that may be flammable, toxic, and/or carcinogenic. Soiled PPE should be cleaned and restored to "good" condition.

  Char, Heat Damage. Or burned areas indicate excessive exposure to heat and/or flame impingement. These areas are damaged and need to be thoroughly checked for strength loss or other signs of degradation. In protective clothing, all three layers should be examined for damage if the outer shell is charred.

  Fabric and/or Material Damage. Is evidenced by rips, tears, cuts, abraded or worn areas, fraying, weak or easily torn areas, and others. This type of damage has many possible causes and can often be repaired. To check for weakening of fabric, flex, attempt to tear, and attempt to push a finger or thumb through the material. The extent and complexity of the damage should be used to determine the appropriate follow-up action. Large areas where quilt stitching is broken or missing may indicate the need to replace the liner.

  Thread and/or Seam Damage. Is evidenced by skipped, broken, or missing stitches. All layers of the PPE must be checked for any type of stitch or seam failure.

  Discolouration. Can indicate many types of possible damage including:



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dye loss, frosting, heat degradation, ultraviolet (UV) damage, chemical contamination, and others. These areas should be thoroughly checked for strength and integrity. Any loss of strength or weakening or the material(s) is a sign of damage and grounds for removal from service for repair or retirement.

Dye Loss. Resulting from heat or chemical contamination (as opposed to general fabric fading) should be thoroughly checked as to the severity of the damage.

Reflective Trim. May be missing, loose, burned, melted, or have lost its retro-reflective properties. Trim may appear to be undamaged to the human eye when it has actually lost much of the ability to reflect. A simple "flashlight" test in a darkened area should suffice for checking retro-reflective properties of reflective trim. Replace trim if the reflected light is substantially less than that which would be seen with new trim.

REPAIRS

For the purpose of this section, the term "repair" will include any and all alterations, modifications, additions, deletions or any other change made to the as-manufactured PPE articles. PPE must be thoroughly cleaned before any repair work is undertaken.

Repairs must be completed on any and all components of PPE, which have been damaged or are affected by the repair.

Repairs must be made using materials and methods in accordance with the applicable standard under which the article was produced (e.g. manufacturer's instructions, CGSB, NFPA, etc.) This should not restrict upgrades approved by the original manufacturer.

Structural Clothing Repairs. In an effort to make this guide as useful as possible, structural clothing is divided into the component layers.

OUTER SHELL

Minor field repairs can be made to the outer shell. The type of repairs that can be accomplished in the field are: minor tears, char marks and ember burns, minor trim repairs, abrasion damage, minor hardware replacement, skipped, broken and missing stitches, and minor closure system repairs.

All repairs and alterations should be done in the same manner and using the same materials as the original manufacturer including: fabric, thread type, stitch construction, hardware and hardware backing.

Major repairs to the outer shell should only be done by the manufacturer or by a repair facility capable of making the needed repairs consistent with the manufacturer's methods and with applicable standards.

MOISTURE BARRIERS

Field repairs to moisture barriers are not acceptable because the steps necessary to ensure that the applicable requirements for hydrostatic testing of the moisture barrier fabric and of the seams is maintained. Moisture barrier materials are found in collars, collar closure systems, and may also be found in other assemblies, including but not limited to storm flaps and sleevewells. Contact the original manufacturer if unsure as to whether an are to be repaired contains a moisture barrier.

All repairs to the moisture barrier must be done by the manufacturer or by a repair facility capable of making the needed repairs consistent with the manufacturer's methods and with applicable standards.

THERMAL LINERS

Minor field repairs can be made to thermal liners providing there is no stitching through the moisture barrier and the manufacturer's materials and methods of construction are maintained. The type of repairs that can be made are: minor tears, char marks and ember burns, skipped, broken or missing stitches, and minor hardware repairs.

FOOTWEAR & GLOVE REPAIR

Because of the complexity of construction, all repairs to rubber boots should be referred to the manufacturer. All repairs and alterations to glove should be referred to the manufacturer or to a repair facility capable of making the repairs consistent with the original manufacturer.

HOOD REPAIR

Repair is generally not practical considering the cost of new hoods.

HELMET REPAIR

It is generally accepted that damaged components be replaced. When the cost of replacement parts exceeds 50% of the cost of a new helmet, the damaged helmet should be replaced.

REPLACEMENT

Personal protective equipment is one of the most important tools that enables firefighters to perform their jobs in a safe and effective manner. Fire departments need to recognize that these items do not have an indefinite life span and that routine periodic inspections are a necessary part of any personal protective equipment program. The costs of cleaning, maintaining, and replacing protective clothing and equipment must be weighed against the potential high costs of injuries to firefighters and liabilities to fire departments.

Personal protective equipment, which is damaged to the extent where it is not economical to repair should be replaced. It is no longer true that dirty and worn out firefighting equipment is a sign of an experienced firefighter. It is now a sign of an uneducated firefighter and potential liability to the employer.

Replacement criteria are based on a number of factors: the age and condition of the item, exposures to products of combustion, hazardous materials, and other contaminants. Physical damage from use and improper cleaning are other factors that may affect when an item should be retired.

When evaluating protective clothing and equipment for repair or replacement, it is recommended that when repair costs will exceed 50% of the replacement costs of the item should be replaced. Additional considerations for retirement include:

- Exposure to extreme heat can cause the outer shell material and or liner materials to become brittle or weak.
- Discoloration to the point where the outer shell and or liner materials become brittle or weak.
- Items exposed to hazardous materials to the point that decontamination is not practical or the cost of cleaning and/or decontamination exceeds 50% of the replacement cost.
- Non-compliance with accepted standards.
- Items showing excessive exposure to UV radiation (sunlight) resulting in significant loss of tensile strength should be retired.
- Replaced items such as gloves and hoods should be destroyed or disposed of in a manner assuring that they will not be used in any "live burn" application.

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Understanding Combustible Sensor Performance

By Robert E. Henderson

Picture courtesy of BW Technologies

THE POTENTIAL PRESENCE OF combustible gases and vapors is one of the most common of all categories of atmospheric hazards. It stands to reason that the sensors used to measure combustible gases are the most widely used type of sensor included in portable atmospheric monitors; especially those used in confined space atmospheric monitoring procedures. In spite of the millions of combustible sensor equipped atmospheric monitors in service in the world, there is still a lot of misinformation and misunderstanding when it comes to the performance characteristics and limitations of this very important type of sensor. Understanding how combustible sensors detect gas is critical to correctly interpreting readings, and avoiding misuse of instruments that include this type of sensor.

WHAT DO PERCENT LEL COMBUSTIBLE GAS SENSORS MEASURE?

In order for an atmosphere to be capable of burning explosively, four conditions must be met. The atmosphere must contain adequate oxygen, adequate fuel, a source of ignition, and sufficient molecular energy to sustain the fire chain reaction. These four conditions are frequently diagrammed as the “Fire Tetrahedron”. If any side of the tetrahedron is missing, incomplete or insubstantial, combustion will not occur.

The minimum concentration of gas or vapor in air that will ignite and explosively burn if a source of ignition is present is the Lower Explosive Limit. Different gases and vapors have different LEL concentrations. Below the LEL, the ratio of combustible gas molecules to oxygen is too low for combustion to occur. In other words, the mixture is “too lean” to burn.

Most (but not all) combustible gases and vapors also have an upper limit of concentration beyond which ignition will not occur. The Upper Explosion Limit or UEL is the maximum concentration of combustible gas or vapor in air that will support combustion. Above the UEL, the ratio of gas to oxygen is too high for the fire reaction to propagate. In other words, the mixture is “too rich” to burn. The difference in concentration between the LEL and UEL is commonly referred to as the Flammability Range. Combustible gas concentrations within the flammability range will burn or explode provided that the other conditions required in the fire tetrahedron are met.

Because the flammability range varies widely between individual gases and vapors, most regulatory standards express hazardous condition thresholds for combustible gas in air in percent LEL concentrations. The most commonly cited hazardous condition threshold concentrations are 5 or 10% LEL. Ten percent LEL is the default alarm set point on many instruments. Most combustible gas instruments read from 0 to 100% LEL. For this reason, most combustible gas reading instruments also display readings in percent LEL increments, with a full range of 0–100% LEL. Typically, these sensors are used to provide a hazardous condition threshold alarm set to 5% or 10% of the LEL concentration of the gases or vapors being measured. Readings are usually displayed in increments of ±1% LEL.

A fire hazard should always be deemed to exist whenever readings exceed 10% LEL. This is the least conservative (or highest acceptable) alarm set point for instruments used for monitoring combustible gases and vapors in confined spaces. An important consideration is that many circumstances warrant a more conservative, lower alarm set point. The presence of any detectable concentration of flammable/combustible gas in the confined space indicates the existence of an abnormal condition. The only completely safe

Understanding Combust

Picture courtesy of BW Technologies

concentration of combustible gas in a confined space is 0% LEL. In addition, specific procedures or activities may require taking action at a lower concentration.

HOW COMBUSTIBLE SENSORS DETECT GAS

Most commonly used combustible gas sensors detect gas by catalytically oxidizing or "burning" the gas on an active bead or "pellistor" located within the sensor. While there are numerous variations, the underlying detection principle has not changed for the better part of a century. The catalytic-bead sensor contains two coils of fine platinum wire, which are coated with a ceramic or porous alumina material to form beads. The beads are wired into opposing arms of a balanced Wheatstone Bridge electrical circuit. One bead is additionally treated with a platinum or palladium-based material that allows catalyzed combustion to occur on the "active" (or detector) bead. The catalyst is not consumed during combustion. Combustion occurs at concentrations far below the LEL concentration. Even trace amounts of gas or vapor in the air surrounding the sensor can oxidize catalytically on the active bead. The "reference" bead in the circuit lacks the catalyst material, but in other respects exactly resembles the active bead.

A voltage applied across the active and reference beads causes them to heat. Heating is necessary for catalytic oxidation to occur. The temperature required may be as high as 500°C, or in some cases, even higher. In fresh air the Wheatstone Bridge circuit is balanced; that is, the voltage output is zero. If combustible gas is present, oxidation heats the active bead to an even higher temperature. The temperature of the untreated reference bead is unaffected by the presence of gas. Because the two beads are strung on opposite arms of the Wheatstone Bridge circuit, the difference in temperature between the beads is registered by the instrument as a change in electrical resistance.

Heating the beads to normal operating temperature requires power from the instrument battery. The amount of power required is a serious constraint on the battery life of the instrument. Recent sensor designs have attempted to reduce the amount of power required by operating the sensor at a lower temperature. While this approach may result in longer battery life, it may also result in the sensor being easier to poison or inhibit, since contaminants, which might have been volatilized at a higher temperature, can more easily accumulate on the bead. It is particularly important to verify the calibration of low power combustible sensors by exposure to known concentration test gas on a regular basis. The combustible sensor elements are usually enclosed in a robust stainless-steel housing. Gas enters the sensor by first passing through a sintered, stainless steel flame arrestor. The sintered flame arrestor tends to act as a physical barrier that slows or inhibits the free diffusion of gas molecules into the sensor. The smaller the molecule, the more readily it is able to diffuse through the flame arrestor, penetrate the sintered surface of the bead, and interact with the catalyst in the oxidation reaction.

> *Catalytic-bead sensors respond to a wide range of ignitable gases and vapors. The amount of heat produced by the combustion of a particular gas/vapor on the active bead reflects the heat of combustion for that substance.*

Catalytic-bead sensors respond to a wide range of ignitable gases and vapors. The amount of heat produced by the combustion of a particular gas/vapor on the active bead reflects the heat of combustion for that substance. The heat of combustion varies from one substance to another. For this reason readings may vary between equivalent concentrations of different combustible gases. As an example, a 50% LEL concentration of pentane provides only about one-half of the heating effect on the active bead of the sensor as a 50% LEL concentration of methane on the same sensor. Another way of expressing this relationship is as a "relative response" of the sensor to pentane. When the instrument is calibrated to methane, the relative response of the sensor to pentane is only 50%. This means that the readings for pentane will be only 50% of the true concentration.

Hot-bead pellistor combustible gas sensors are unable to differentiate between different combustible gases. They provide one signal based on the total heating effects of all the gases capable of being oxidized that are present in the vicinity of the sensor.

ible Sensor Performance

ROLE OF FLASH POINT IN MONITORING OF IGNITABLE GASES AND VAPORS

In order for combustion to occur, the vapor of the substance must be present in the atmosphere. As a general rule, it's the vapor, not the liquid that burns. Vaporization is a function of temperature. Increasing the temperature of the liquid increases the rate and amount of vapor that is produced. The flashpoint temperature is the minimum temperature at which a liquid gives off enough vapor to form an ignitable concentration.

Catalytic-bead sensors, at least when operated in the percent LEL range, may not adequately detect "heavy" or long-chain hydrocarbons, or the vapors from high flashpoint temperature liquids such as turpentine's, diesel fuel or jet fuel. Use of alternative types of gas detectors, such as a photoionization detector (PID) may be a better approach if you need to monitor for the presence of these types of hydrocarbon vapors. Some manufacturers suggest that their percent LEL sensors should not be used measure volatile aromatic compounds (VOCs) or combustible liquids with flashpoint temperatures higher than 100°F (38°C). Consult the Operator's Manual, or contact the manufacturer directly to verify the capabilities of the instrument design when using a catalytic-bead LEL sensor to monitor for the presence of these types of contaminants.

CATALYTIC-BEAD COMBUSTIBLE SENSORS NEED OXYGEN TO DETECT GAS

Catalytic-bead sensors require at least eight to ten percent oxygen by volume to detect accurately. A combustible sensor in a 100 percent gas or vapor environment will produce a reading of zero percent LEL. This is the reason that testing protocols for evaluating confined spaces specify measuring oxygen first and then combustible gases and vapors. For this reason confined space instruments that contain catalytic-bead sensors should also include a sensor for measuring oxygen. If the instrument being used does not include an oxygen sensor, be especially cautious when interpreting results. A rapid up-scale reading followed by a declining or erratic reading may indicate that the environment contains insufficient oxygen for the sensor to read accurately. (It may also indicate a gas concentration beyond the upper scale limit for the sensor, the presence of a contaminant, which has caused a sudden inhibition, or loss of sensitivity in the sensor, or other condition, which prevents the sensor or instrument from obtaining proper readings.) The minimum amount of oxygen that must be present for the sensor to detect accurately is a function of design. Capabilities vary from one manufacturer to another. Users who anticipate using their instruments in potentially oxygen deficient environments should contact the manufacturer for assistance.

CALIBRATION AND RELATIVE RESPONSE OF COMBUSTIBLE SENSORS

A combustible gas sensor may be calibrated to any number of different gases or vapors. Where possible, the user should calibrate the instrument to achieve the level of sensitivity required for the substances to be measured.

Calibration is a two-step procedure. In the first step the instrument is exposed to contaminant free "fresh" air (that is, air which contains 20.9% oxygen and no combustible gas), turned on, and allowed to warm-up fully. The combustible sensor should read zero. If necessary, the combustible sensor is adjusted to read zero. Instrument manuals and other support materials usually refer to this step as the "fresh air zero."

The second step is to expose the sensor to known concentration calibration gas, and (if necessary) adjust the readings to match the concentration. This is called making a "span adjustment". A "span adjustment" sets the sensitivity of the sensor to a specific gas. Always follow the manufacturer's instructions when calibrating or adjusting the instrument.

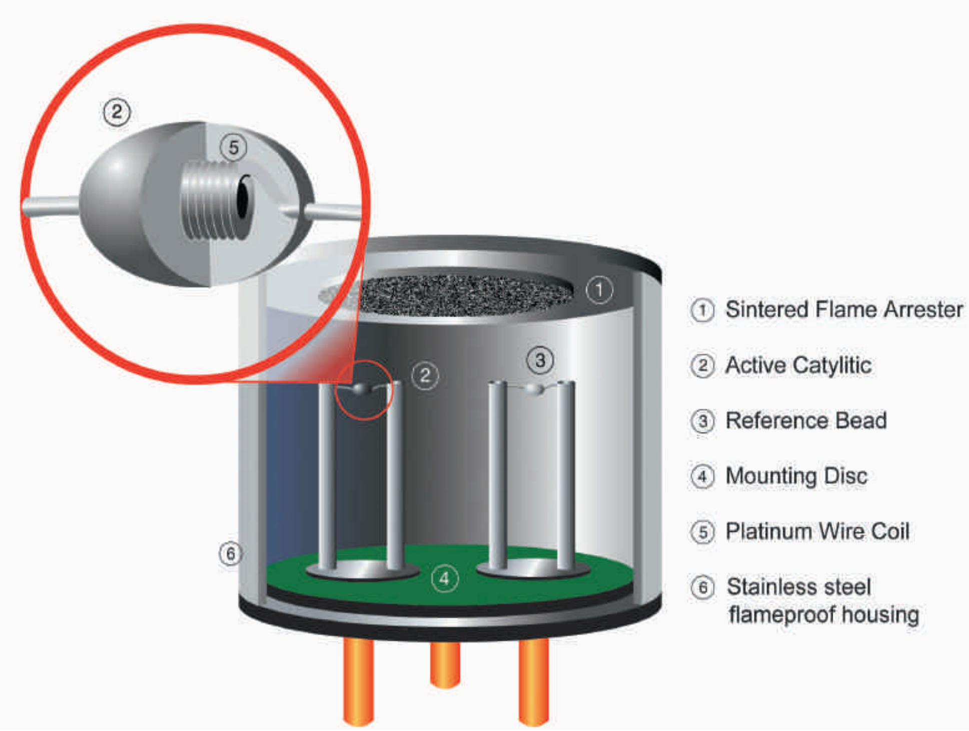
Instruments used only for a monitoring a single gas should be calibrated with that particular gas. Calibration choices are more difficult when the instrument may be exposed to a variety of different combustible gases because, as noted previously, equivalent concentrations of different combustible gases may produce different readings. Gases that produce lower relative readings than the gas used to calibrate the instrument can create a potentially dangerous error.

CATALYTIC-BEAD POISONS AND INHIBITORS

The atmosphere in which an instrument is used can have an effect on catalytic-bead sensors. Poisoning or degraded performance can occur when combustible sensors are exposed to certain substances. Commonly encountered substances that degrade LEL sensor performance include silicones; lead containing compounds (especially tetraethyl lead), sulfur containing compounds, substances containing phosphorus and halogenated hydrocarbons. Combustible sensors can also be affected by exposure to high concentrations of ignitable mixtures.

Any conditions, incidents, experiences, or exposure to contaminants that might adversely affect the combustible sensor should trigger immediate verification of the proper performance of the sensor before continued use. This can be done very simply by flowing known concentration test gas over the sensor, and noting the response. If the readings

> *The atmosphere in which an instrument is used can have an effect on catalytic-bead sensors. Poisoning or degraded performance can occur when combustible sensors are exposed to certain substances.*



Picture courtesy of BW Technologies

are accurate, the sensor is safe to use. If the readings are inaccurate or out of calibration, the sensor must be recalibrated before further use.

POTENTIAL FOR LOSS OF SENSITIVITY TO METHANE

Age and usage can affect the sensitivity of combustible sensors. Chronic exposure to low levels of poisons or inhibitors acts cumulatively. This usually means that the sensitivity must be increased when calibration occurs. In the extreme, the sensor may require replacement. This again demonstrates that regular calibration is essential to the safe use of combustible sensors.

For many combustible sensors, if sensitivity is lost due to poisoning, it tends to be lost first with regards to methane. This means that a partially poisoned sensor might still respond accurately to other combustible gases while showing a significantly reduced response to methane. This is a particularly important concern for instruments used to monitor atmospheres associated with confined spaces, where methane is by far the most commonly encountered combustible gas.

There are several calibration strategies used by manufacturers to guard against incorrect readings due loss of sensitivity to methane. The first is to calibrate the instrument using the calibration gas, which provides the best level of sensitivity (for instance propane or pentane) and then expose the sensor to a known concentration of methane. The relative response factor for methane can then be used to verify whether there has been loss of sensitivity. This approach increases the time needed to calibrate the instrument and complicates the logistics. Another problem is what to do if there has been a loss of sensitivity to methane.

The second approach is to calibrate the instrument directly to methane. An instrument “spanned” to methane will continue to detect methane accurately even when loss of sensitivity develops. Spanning the instrument during calibration simply makes up for any loss in sensitivity. However, when the sensor is calibrated with methane, readings for most other substances tend to be lower than actual.

> *Age and usage can affect the sensitivity of combustible sensors. Chronic exposure to low levels of poisons or inhibitors acts cumulatively.*

The third approach is to calibrate using methane at a concentration that produces a level of sensitivity equivalent to that provided by the gas of greatest interest. Several manufacturers offer “equivalent” or “simulant” calibration mixtures based on methane, but in concentrations that provide the same span sensitivity as direct calibration using propane, pentane or hexane calibration gas. As previously discussed, 50% LEL pentane produces one-half the heating effect on the active bead in a normally functioning sensor as a 50% LEL concentration of methane. This also means that if you use a 25% LEL concentration of methane, but “span” adjust the readings to equal 50% LEL while the sensor is exposed to this gas, you wind up with a pentane level of span sensitivity, but since you have used methane to calibrate the instrument, you know that the sensor is still responsive to methane.

The fourth approach now offered by many manufacturers is to include a user selectable library of correction factors in the instrument design. In this case, the user simply calibrates using methane, then selects “pentane” or any other correction factor in the library, and the instrument automatically recalculates readings according to the selected relative response. The benefit of this method, once again, is that since methane is used as the calibration gas, incremental loss of sensitivity to methane simply results in the instrument being “over-spanned”, or producing higher than actual readings for the gas selected from the library of correction factors.

Calibration verifies that sensors remain accurate. If exposure to test gas indicates a loss of sensitivity, the instrument needs adjustment. If the sensors cannot be properly adjusted, they must be replaced before any further use of the instrument. This is an essential part of ownership.

Robert Henderson is Vice President, Business Development for BW Technologies. Mr. Henderson has been a member of the American Industrial Hygiene Association since 1992. He is a currently the Vice Chair of the AIHA Gas and Vapor Detection Systems Technical Committee. He is also a current member and past chair of the AIHA Confined Spaces Committee. He is also a past chair of the Instrument Products Group of the International Safety Equipment Association.

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Kidde Fire Protection has a total capability approach to fire suppression. Kidde manufactures all major fire suppression technologies with systems having international third party approvals and certification, and is therefore able to provide unbiased guidance on selecting the right suppression solution.

The main product groups are Carbon Dioxide, Water mist, Inert gas such as Argonite, plus Chemical agents FM-200® and 3M™ Novec™ 1230 Fire Protection Fluid. Other generic suppression agents are available but these are in the minority and often have associated restrictions that limit their uses.

Carbon Dioxide

CO_2 has been part of the Kidde range since the 1930s. Suitable for "total flood" or "local application" systems it has long been established as a cost effective and versatile solution for industrial applications. Naturally occurring in the atmosphere, CO_2 has no environmental restrictions on fire fighting use. Although an asphyxiant, it is used widely in unmanned applications. It can be used in manned areas, providing appropriate restrictions and safety measures are adhered to. Evidence from over 100,000 CO_2 systems installed in the past 50 years shows that CO_2 can be used safely.

AquaSafe

This "water mist" technology uses water, the most natural of substances, deployed as a fine mist made up from droplets in the range of 40 to 400 micron in diameter. It works by a combination of cooling and inerting and has the added advantage of removing airborne smoke particles and absorbing water-soluble toxic and irritant gases. However, water mist is not a total flooding agent and is transient in nature. It must be recognised that permanent extinguishing may not be attained if re-ignition sources are present.

Argonite

Argonite is an "inert gas blend", 50% Argon and 50% Nitrogen. With zero Ozone Depletion Potential and Global Warming Potential, it has no atmospheric lifetime. When Argonite is discharged into an enclosed space it displaces oxygen, reducing it from the normal 21% to a level at which fires will be effectively extinguished. A typical design concentration of 40% will reduce the oxygen level to 12.5% within 60 seconds. In occupied areas, personnel can continue to breathe safely at this level for short periods of time. Although the space requirement for storage cylinders may be greater than that for chemical agents, with cylinder storage pressures of 300bar it can protect large volumes with cylinder storage remote from the risk.

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FM-200 (HFC227ea) is a hydroflourocarbon with wide global acceptance. With a zero Ozone Depletion Potential and a short atmospheric lifetime, it has proved to be the most widely used Halon replacement, and an excellent fire suppression agent in its own right, with tens of thousands of systems installed worldwide. It works by absorbing heat from both the flame and the fuel, reducing the temperature to a point where the flame cannot sustain itself and the fire is extinguished. Short discharge times of typically 6 to 10 seconds provide rapid extinguishing. It's safe for use in occupied areas within prescribed concentrations and exposure times. With a relatively small cylinder storage footprint FM-200 is ideally suited to use in areas were space is at a premium or weight restrictions apply.

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Re-defining risk management in a "green" world

3M RF-Series foams have played a critical role in the successful extinguishment of large-scale fire emergencies in the Middle East, Japan and other areas around the world

MANAGING RISK IS AN overriding concern that cuts across all business sectors, from manufacturing and transportation to oil/gas exploration, production and refining. Technologies used to mitigate risks – such as fire fighting foams – have traditionally been evaluated primarily on their ability to promote personnel safety, continuity of operations and property protection.

In recent years, however, increasing public interest in the long-term environmental, health and safety effects of all chemical products has greatly expanded the scope and definition of risk management. Business decisions now must take into consideration whether the use or mis-use of a particular product will increase the risk of fines, litigation and damage to corporate reputations.

One clear example of this trend has played out over the past few years in the area of providing fire protection for hazards involving flammable liquids. Here, a number of related technologies (in the form of synthetic and semi-synthetic foams, most of which employ fluorine-based surfactants) had been developed and used with great success over several decades to mitigate risks from fires and fuel spills.

Today, however, increased regulatory scrutiny of the long-term environmental characteristics of conventional fire fighting foams has resulted in a growing interest in alternative technologies that can not only provide effective extinguishment or vapour suppression of flammable liquid hazards, but that also have minimal effect on the environment and human health, and offer the added benefit of significantly reduced cost of clean-up after use.

Recent efforts by foam manufacturers to achieve this ideal balance of properties have met with limited success. However, in 2003, 3M Australia formally introduced a unique new foam technology, 3M™ RF-Series Fire Fighting Foams, that uses no fluorochemicals in its formulation, while offering comparable performance to commercially available AFFFs.

According to Chizzy Nnamchi, Business Development Manager, Oil & Gas Business, 3M Asia Pacific, the widespread acceptance of 3M RF foam technology by professional firefighters around the world is directly attributable to industry's need for better ways to manage today's expanded definitions of risk.

"Fire professionals have been under increasing pressure to consider the environmental issues surrounding their use of firefighting foams," he said. "That's why there has been so much interest surrounding our new 3M RF-Series foams, which contain no fluorochemicals in their formulations, and can be successfully treated in biological wastewater treatment systems."

Nnamchi is quick to point out, however, that extinguishing and sealing performance is still the primary consideration used to evaluate any fire fighting foam. This is the critical area, he says, where 3M RF-Series foams leave other so-called "green" foam technologies far behind.

"3M RF-Series foams have been demonstrated to meet and exceed a number of critical international standards, including the rigid ICAO Level-B specification and meeting CEN/EN-1568 requirements for extinguishing and securing performance," he says. "And it is the only non-fluorocarbon-based foam concentrate to meet the ICAO Level-B fire performance rating, with test results witnessed by Det Norske Veritas (DNV)."

Successful performance under controlled test conditions is important; but the real measure of a foam's ability to reduce risk can only be judged by its performance in real-world emergencies. In the short time since their introduction, 3M RF-Series foams have played a critical role in the successful extinguishment of a number of large-scale fire emergencies in the Middle East, Japan and other areas around the world. Ted Schaefer, a chemist with 3M Australia who led the team that developed the new 3M RF foam technology, explains that although these foams use a different extinguishing and securing mechanism than AFFFs or fluoroprotein foams, firefighters should notice little difference in their application or performance.

"The new 3M RF-Series foams move rapidly over the surface of hydrocarbon liquids, providing fast extinguishment and effective vapour suppression. The long-lasting, self-healing foam blanket produced has excellent heat resistance, and will stick to hot metal surfaces." He went on to say that 3M RF-Series foams are effective in most conventional fixed and portable foam equipment and systems, and are compatible with dry chemical agents.

This unique combination of performance and environmental attributes is the reason why a growing number of refineries, airports, shipowners and other emergency responders are making 3M RF-Series foams their "weapon of choice" for flammable liquid fire protection. Nor has their use been confined to industrial firefighters. According to Marino Mystegniotis, Oil and Gas Market Business Manager with 3M Australia, municipal and rural fire brigades in New Zealand, Tasmania, Queensland and elsewhere in Australia have adopted or are evaluating 3M RF-3 foam for use against transportation emergencies, bush fires and even for training purposes. "By improving the wetting and penetrating properties of water, 3M RF-3 foam provides outstanding extinguishment of Class-A fires involving furnishings, wood, rubbers and plastics," he explains. "And it can be successfully treated in biological wastewater treatment systems."

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20 Litres

3M's newest RF-Series product, 3M™ RF-ATC Foam Concentrate, is designed for use against both hydrocarbon and polar solvent hazards

The growing market acceptance of 3M RF-Series foams among firefighters, insurers, equipment manufacturers and end users comes as no surprise to 3M's Nnamchi, who points out that 3M has a long tradition of innovation in flammable liquid fire protection. In fact, he says, this tradition dates back to the 1960s, when the company worked with the U.S. Navy to develop the first aqueous film-forming foams (AFFFs), and continues to this day.

"Since the year 2000, when 3M announced it was discontinuing the manufacture of perfluorooctanyl chemistry – a chemistry that was used in formulating 3M™ Light Water™ Foam products – we have been working hard to develop alternative chemistries that would offer our customers an improved balance of performance and environmental properties," he explains.

Nnamchi goes on to say, however, that there is a third key factor – beyond performance and environmental properties – that determines a foam product's ability to reduce risk. Specifically the question is, in the event of a large-scale emergency, can sufficient supplies of that foam be marshaled to the scene, in order to mount a quick, decisive attack? And, can that be accomplished, no matter where or how remote the location?

"3M™ Light Water™ Firefighting Foam became one of the world's best-selling brand of foam products, not only because of its performance, but because of the extensive emergency response network that was developed to support its users in the oil and gas, aviation, marine and other industries. Today, we are committed to providing that same level of support to users of 3M RF-Series products." He explains that this support is manifested in a variety of ways, including rapid deployment of emergency foam stocks; coordinating response efforts with partnering companies such as ALERT Disaster Control; regular foam quality testing; technical support; and training.

3M RF-Series foams are available in both 3% and 6% concentrate form, for hydrocarbons, gasohols and Class A hazards, and as a new alcohol-type concentrate, designed for both hydrocarbon and polar solvent hazards. This latest product, 3M™ RF-ATC Foam Concentrate, will be introduced to the market in March this year.

Other 3M fire protection products include 3M™ Fire-Brake Bushfire Fighting Foam; 3M™ Super Concentrate Training Foam; 3M™ Hi-Ex Foam, for use in confined spaces such as mine shafts and ship holds; and 3M™ Novec™ 1230 Fire Protection Fluid, a low global-warming clean extinguishing agent halon replacement alternative to HFCs.

Successful performance under controlled test conditions is important; but the real measure of a foam's ability to reduce risk can only be judged by its performance in real-world emergencies.

For more information on
3M RF-Series foams, contact:
3M TECHNOLOGIES (S) PTE LTD.
Fire Fighting Foam Products
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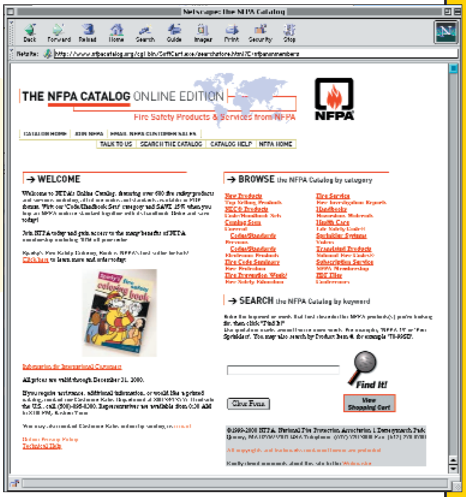
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DECONTAMINATION SHOWERS MARKET GUIDE

The Aire Group
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Dale Street
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Huddersfield
West Yorkshire HD3 4TD
England
Tel: +44 1484 646 559
Fax: +44 1484 644 450
E-mail: info@airegroup.com
Website: www.airegroup.com

AIRE GROUP LTD.

MODEL	**Aireshower**
ORIGIN	UK
CONSTRUCTION	Inflatable
MODULAR (Y or N)	Yes
OUTSIDE DIMENSIONS (Metres)	2.4 L x 2.1 W x 2.3 H
WEIGHT	70kg
MATERIAL USED	1300gm/m Hypalon
INTERNAL LAYOUT	Single Stage
ACCEPTS STRETCHER (Y or N)	Yes
INTEGRAL SUMP (Y or N)	Yes
DEPLOYMENT TIME	Less than 5 minutes
THROUGHPUT (Number per hour)	120 Walking
MAIN USAGE	Mass Decontamination
ADAPTABLE TO DIFFERENT CLIMATES (Y or N)	Yes

AUTOFLUG INFLATABLE STRUCTURES GmbH

MODEL	**DK 04**	**DK 08**	**DK 10**	**DK 15**	**DK 30**
ORIGIN	GERMANY	GERMANY	GERMANY	GERMANY	GERMANY
CONSTRUCTION Rigid = R Inflatable = I Demountable Body = DB Trailer = T	I	I	I	I	I
MODULAR (Y or N)	N	N	Y	Y	Y
OUTSIDE DIMENSIONS (Metres)	2 x 2 x 2,4	2 x 3,8 x 2,4	3,1 x 3,7 x 2,4	5 x 3 x 2,8	6 x 6 x 2,9
WEIGHT	30kg	50kg	50kg	70kg	115kg
MATERIAL USED	PVC cabin	PVC cabin	Tent with inside showercabin		
INTERNAL LAYOUT Single Stage = S Multi-Stage = M Reconfigurable = R	S	S	S	S	M
ACCEPTS STRETCHER (Y or N)	Y	Y	Y	Y	Y
INTEGRAL SUMP (Y or N)	Y	Y	Y	Y	Y
DEPLOYMENT TIME	3 – 5 minutes	3 – 5 minutes	3 – 5 minutes	5 – 7 minutes	5 – 7 minutes
THROUGHPUT (Number per hour)	10 – 12	10 – 20	40 – 60	40 – 60	40 – 60
MAIN USAGE Emergency Service Personnel = P Equipment = E Mass Decontamination = M	P/E	P/E	P/E/M	P/E/M	P/E/M
ADAPTABLE TO DIFFERENT CLIMATES (Y or N)	N	N	Y	Y	Y

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D-25462 Rellingen/Germany
Tel: +49 4101 307-312
Fax: +49 4101 307-316
E-mail: Vertrieb.Sales@autoflug.de
Website: www.autoflug.com

No picture available

FSI FIRE SAFETY INTERNATIONAL, INC.™

MODEL	**DAT™2020S**	**DAT™2525S**	**DAT™2626S**	**DAT™3030S**	**DAT™3535S**
ORIGIN	USA	USA	USA	USA	USA
CONSTRUCTION Rigid = R Inflatable = I Demountable Body = DB Trailer = T	I	I	I	I	I
MODULAR (Y or N)	N	N	N	N	N
OUTSIDE DIMENSIONS (Metres)	2.12 W x 2.12 L x 2.12 H	2.12 W x 4 L x 2.4 H	2.12 W x 4 L x 2.4 H	3.03 W x 3.03 L x 2.4 H	3.03 W x 4.5 L x 2.4 H
WEIGHT (Kg)	36	42	42	43	63
MATERIALS all FSI units are UV/Chem. Resist. & Fire retardant	1100 Dtex	plastomer coated	polyester berms	420 denier poly	coated nylon
INTERNAL LAYOUT Single Stage = S Multi-Stage = M Reconfigurable = R	S/R	M/R	S/R	M/R	M/R
ACCEPTS STRETCHER (Y or N)	N	Y	Y	Y x 2	Y x 2
INTEGRAL SUMP (Y or N)	N	N	N	N	N
DEPLOYMENT TIME in minutes	30 seconds	30 seconds	30 seconds	30 seconds	40 seconds
THROUGHPUT (No./hour) Based on what criteria?	6-30	18-90	6 to 12	12 to 24	24-130 amb/12-24 non amb
MAIN USAGE Emergency Service Personnel = P Equipment = E Mass Decontamination = M	P/E	P/E/M	P/E/M	P/E/M	P/E/M
ADAPTABLE TO DIFFERENT CLIMATES (Y or N)	Y	Y	Y	Y	Y

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Website: www.fsinorth.com

DQE, INC.

MODEL	HM1001	HM3000	HM4000	HM2000
ORIGIN	USA	USA	USA	USA
CONSTRUCTION Rigid = R Inflatable = I Demountable Body = DB Trailer = T	R	R	R	R
MODULAR (Y or N)	Y	N	Y	N
OUTSIDE DIMENSIONS (Metres)	.68 L x .68 W x 1.87 H	1.09 L x 1.18 W x 2.25 H	3.04 L x .91 W x 2.13 H	1.44 L x .66 W x 2.20 H
WEIGHT	43.09kg	20.41kg	81.64kg	7.25kg
MATERIAL USED	PVC	PVC	PVC	PVC
INTERNAL LAYOUT Single Stage = S Multi-Stage = M Reconfigurable = R	S	S	M	S
ACCEPTS STRETCHER (Y or N)	Y	Y	Y	N
INTEGRAL SUMP (Y or N)	N	N	N	N
DEPLOYMENT TIME	3-4 minutes	2 minutes	10 minutes	2 minutes
THROUGHPUT (Number per hour)	20	20	80	15
MAIN USAGE Emergency Service Personnel = P Equipment = E Mass Decontamination = M	P	P	M	P
ADAPTABLE TO DIFFERENT CLIMATES (Y or N)	Y	Y	Y	Y

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E-mail: cmuckridge@dqeready.com
Website: www.dqeready.com

HUGHES SAFETY SHOWERS LTD.

MODEL	CUPOLAdecon 1	CUPOLAdecon 2	CUPOLAdecon 3	CUPOLAdecon 4	CUPOLAdecon 5
ORIGIN	UK	UK	UK	UK	UK
CONSTRUCTION Rigid = R Inflatable = I Demountable Body = DB Trailer = T	I	I	I	I	I
MODULAR (Y or N)	Y	Y	Y	Y	Y
OUTSIDE DIMENSIONS (Metres)	4.05 L x 3.45 W x 2.94 H	3.4 L x 2.8 W x 2.65 H 4.4 L x 2.8 W x 2.65 H (with sump extension)	3.5 L x 4.3 W x 3.0 H	4.5 L x 4.3 W x 3.0 H	5.5 L x 4.3 W x 3.0 H
WEIGHT	75kg	85kg	100kg	125kg	150kg
MATERIAL USED	Neoprene coated polyester/ Polyurethane	Neoprene coated polyester/ Polyurethane	Neoprene coated polyester/ Polyurethane	Neoprene coated polyester/ Polyurethane	Neoprene coated polyester/ Polyurethane
INTERNAL LAYOUT Single Stage = S Multi-Stage = M Reconfigurable = R	M/R	S	M/R	M/R	M/R
ACCEPTS STRETCHER (Y or N)	Y	Y	Y	Y	Y
INTEGRAL SUMP (Y or N)	Y	Y	Y	Y	Y
DEPLOYMENT TIME	8 minutes	7 minutes	8 minutes	8 minutes	8 minutes
THROUGHPUT (Number per hour)	500 – 800	100	200 – 300	250 – 350	350 – 450
MAIN USAGE Emergency Service Personnel = P Equipment = E Mass Decontamination = M	M	P/E	M	M	M
ADAPTABLE TO DIFFERENT CLIMATES (Y or N)	Y	Y	Y	Y	Y

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Website: www.hughes-safety-showers.co.uk

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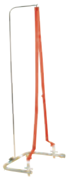
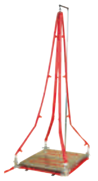
HUGHES SAFETY SHOWERS LTD. cont.

MODEL	PORTAflex 75	PORTAflex 200	PORTAflex 300	PORTAflex 500
ORIGIN	UK	UK	UK	UK
CONSTRUCTION Rigid = R Inflatable = I Demountable Body = DB Trailer = T	R	R	R	R
MODULAR (Y or N)	N	N	N	N
OUTSIDE DIMENSIONS (Metres)	1.04 L x 0.76 W x 2.5 H	1.28 L x 0.52 W x 2.5 H	0.77 L x 0.5 W x 2.5 H	1.4 L x 0.4 W x 2.5 H
WEIGHT	17kg	29.5kg	25kg	85kg
MATERIAL USED	Stainless Steel/Aluminium/ Duraline lay flat hosing	Stainless Steel/Aluminium/ Duraline lay flat hosing	Aluminium	Aluminium
INTERNAL LAYOUT Single Stage = S Multi-Stage = M Reconfigurable = R	S	S	S	S
ACCEPTS STRETCHER (Y or N)	N	N	N	N
INTEGRAL SUMP (Y or N)	N	N	N	N
DEPLOYMENT TIME	30 seconds	30 seconds	45 seconds	5 minutes
THROUGHPUT (Number per hour)	N/A	N/A	N/A	N/A
MAIN USAGE Emergency Service Personnel = P Equipment = E Mass Decontamination = M	P/E	P/E	P/E	P
ADAPTABLE TO DIFFERENT CLIMATES (Y or N)	Y	Y	Y	Y





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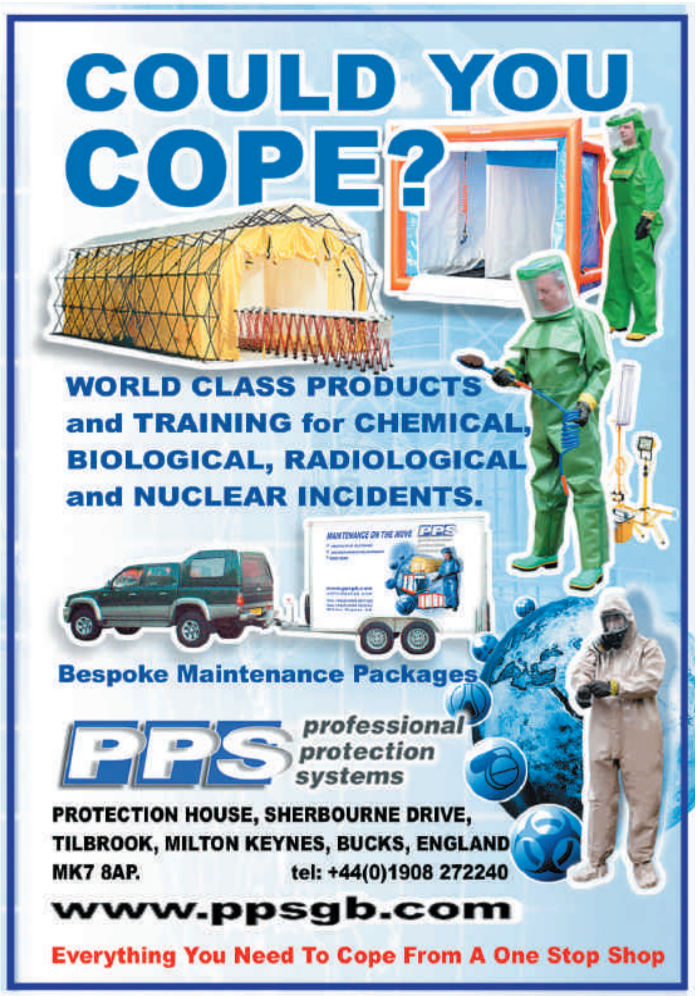
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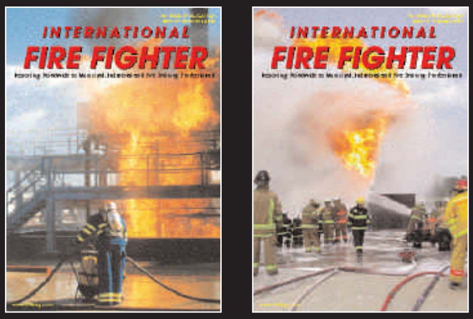

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Shower System

The DAT™ 4099S 5-line Mass Casualty Decon Shower System decontaminates 5 and/or up to 10 non-ambulatory, 5 and/or up to 10 ambulatory personnel or any combination in a 5′ L undress area/ 13′ L shower area/ 5′ redress area configuration.

This is a one piece, 15′ W x 23′ L x 9′ H, fully integrated Mass Casualty unit with built-in decon shower pool area complete with all shower heads, trigger guns, 4 center and 15 – 1/5th cross divider privacy curtains, windows, skylights, inflator/deflator, ropes/stakes, repair kit, manual, high pressure SCBA compressed air fill valve, air vents.
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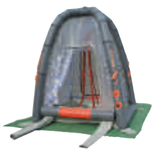
MODEL	PORTAflex CUPOLA	PORTAdec 1000	PORTAdec 2000	Emergency Response and decontamination Unit (ERDU)
ORIGIN	UK	UK	UK	UK
CONSTRUCTION Rigid = R – Inflatable = I Demountable Body = DB – Trailer = T	I	R	R	DB
MODULAR (Y or N)	N	N	N	N
OUTSIDE DIMENSIONS (Metres)	2.2 L x 2.2 W x 2.6 H	1.1 L x 1.1 W x 2.7 H	2.2 L x 1.1 W x 2.55 H	Standard body pod 6.0 L x 2.2 W x 2.82 H – other sizes to order
WEIGHT	45kg	40kg	100kg	Depends on design
MATERIAL USED	Neoprene coated polyester/ Polyurethane	PVC coated nylon/ Aluminium	PVC coated Nylon/ Aluminium	GRP faced panels/Aluminium frame
INTERNAL LAYOUT Single Stage = S – Multi-Stage = M Reconfigurable = R	S	S	S	M/R
ACCEPTS STRETCHER (Y or N)	N	N	Y	Y
INTEGRAL SUMP (Y or N)	Y	Y	Y	Y
DEPLOYMENT TIME	2 minutes	4 minutes	3 minutes	5 minutes
THROUGHPUT (Number per hour)	N/A	N/A	N/A	150 – 250
MAIN USAGE Emergency Service Personnel = P Equipment = E Mass Decontamination = M	P	P/E	P/E	P/M
ADAPTABLE TO DIFFERENT CLIMATES (Y or N)	Y	Y	Y	Y



PPS

MODEL	Decas V10 Custom	Fire Service Custom Built	DPI	DPI x2
ORIGIN	UK	USA	UK	UK
CONSTRUCTION Rigid = R Inflatable = I Demountable Body = DB Trailer = T	I	R /T	I	I
MODULAR (Y or N)	Y	N	Y	Y
OUTSIDE DIMENSIONS (Metres)	Custom Built	Custom Built	1.9 L x 1.9 W x 2.3 H	2.9 L x 1.9 W x 2.3 H
WEIGHT	Custom Built	Custom Built	35kg	42kg
MATERIAL USED	Custom Built	Custom Built	PU	PU
INTERNAL LAYOUT Single Stage = S Multi-Stage = M Reconfigurable = R	Custom Built S/M/R	Custom Built S/M/R	S	
ACCEPTS STRETCHER (Y or N)	Y	Y	N	Y
INTEGRAL SUMP (Y or N)	Y	Y	Y	Y
DEPLOYMENT TIME	Variable	Variable	2 minutes	2 minutes
THROUGHPUT (Number per hour)	Variable	Variable	Variable	Variable
MAIN USAGE Emergency Service Personnel = P Equipment = E Mass Decontamination = M	P/E/M	P/E/M	P/E	P/E
ADAPTABLE TO DIFFERENT CLIMATES (Y or N)	Y	Y	Y	Y

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E-mail: sales@ppsgb.com
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PPS cont.

MODEL	DPI NBC	DECAS NBC	DECAS W	DECAS V2
ORIGIN	UK	UK	UK	UK
CONSTRUCTION Rigid = R Inflatable = I Demountable Body = DB Trailer = T	I	I	I	I
MODULAR (Y or N)	Y	Y	Y	Y
OUTSIDE DIMENSIONS (Metres)	Custom Built	Custom Built	2.9 M L x 1.9 M W x 2.3 M H	2.9 M L 1.9 M W x 2.3 M H
WEIGHT	Custom Built	Custom Built	40kg	40kg
MATERIAL USED	PU	PU	PU	PU
INTERNAL LAYOUT Single Stage = S Multi-Stage = M Reconfigurable = R	Custom Built	Custom Built	Custom Built	Custom Built
ACCEPTS STRETCHER (Y or N)	Y	Y	Y	Y
INTEGRAL SUMP (Y or N)	Y	Y	Y	Y
DEPLOYMENT TIME	2 minutes	2 minutes	2 minutes	2 minutes
THROUGHPUT (Number per hour)	Variable	Variable	Variable	Variable
MAIN USAGE Emergency Service Personnel = P Equipment = E Mass Decontamination = M	P/E	P/E	P/E	P/E
ADAPTABLE TO DIFFERENT CLIMATES (Y or N)	Y	Y	Y	Y

PPS cont.

MODEL	DECAS V3	DECAS X2 T	NHS NBC UNIT	MP DECON SYSTEM
ORIGIN	UK	UK	UK	USA
CONSTRUCTION Rigid = R Inflatable = I Demountable Body = DB Trailer = T	I	I	I	R
MODULAR (Y or N)	Y	Y	Y	N
OUTSIDE DIMENSIONS (Metres)	5.5 L x 2.9 W x 2.3 H	2.9 L x 2.9 W x 2.3 H	2.9 L x 2.9 W x 2.3 H	Qty 4 off – 4 L x 3.5 W x 2.75 H
WEIGHT	120kg	75kg	65kg	82kg
MATERIAL USED	PU	PU	PU	Custom Built
INTERNAL LAYOUT Single Stage = S Multi-Stage = M Reconfigurable = R	Custom Built	Custom Built	Custom Built	Custom Built
ACCEPTS STRETCHER (Y or N)	Y	Y	Y	Y
INTEGRAL SUMP (Y or N)	Y	Y	Y	Y
DEPLOYMENT TIME	4 minutes	4 minutes	4 minutes	15 minutes all 4 sections
THROUGHPUT (Number per hour)	Variable	Variable	Variable	Variable
MAIN USAGE Emergency Service Personnel = P Equipment = E Mass Decontamination = M	P/E/M	P/E/M	P/E/M	P/E/M
ADAPTABLE TO DIFFERENT CLIMATES (Y or N)	Y	Y	Y	Y

PPS cont.

MODEL	3 LINE DECON SYSTEM	2 LINE DECON SYSTEM	INDIVIDUAL DECON SYSTEM	FIRST RESPONSE
ORIGIN	USA	USA	USA	UK
CONSTRUCTION Rigid = R Inflatable = I Demountable Body = DB Trailer = T	R	R	R	I
MODULAR (Y or N)	N	N	N	Y
OUTSIDE DIMENSIONS (Metres)	6 L 3.35 W x 2.75 H	6.9 L x 3.35 W x 2.75 H	1.52 L x 1.83 W x 2.75 H	Variable
WEIGHT	98kg	98kg	25kg	Variable
MATERIAL USED		Custom Built	Custom Built	Custom Built
INTERNAL LAYOUT Single Stage = S Multi-Stage = M Reconfigurable = R		Custom Built S/M/R	Custom Built S	Custom Built S/M/R
ACCEPTS STRETCHER (Y or N)	Y	Y	N	Y
INTEGRAL SUMP (Y or N)	Y	Y	Y	Y
DEPLOYMENT TIME	Variable	Variable	3 minutes	15 minutes
THROUGHPUT (Number per hour)		Variable	Variable	Variable
MAIN USAGE Emergency Service Personnel = P Equipment = E Mass Decontamination = M		P/E/M	P/E	P/E/M
ADAPTABLE TO DIFFERENT CLIMATES (Y or N)	Y	Y	Y	Y

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Picture courtesy of Draeger Safety

Realistic an Fire Tr

By Jakob Spiegel
Consultant, Fire Training Systems
Chairman, Fire Brigade Association of Kaiserslauten, Germany

THEORY AND DRY TRAINING do not adequately prepare the emergency responder to be able to meet and effectively deal with the dangerous conditions that occur during fire fighting operations. During training, the trainees must be exposed to live fire under safe and controlled conditions in order to gain the required confidence and skills.

Modern systems provide a level of safety that far exceeds concepts previously experienced in fire training. A "state-of-the-art" control system, instructor pendants and a wide range of automatic and manual safety features provide 100% safety and security at all times during training.

The new range of PLC- or computer controlled, gas fuelled hot fire training systems offer the optimal training platforms for any kind of fire training allowing fire-fighters to effectively achieve all hot-fire training objectives.

Previous live fire training systems used Class A combustible materials or diesel fuel for live fire training. Missing safety features caused many injuries to trainees as these fires were out of control, without any safety features. Inside a building such fires were ignited within a conventional building, without any special protection for the structure of the building and thus with a high safety risk for the training fire fighters.

In addition, these conventional combustibles caused high pollution to water, air and soil of the training ground. Nowadays, environmental rules and regulations do not allow live fire training facilities to use materials that are likely to pollute the environment.

Gas fuelled, PLC- and computer-controlled systems are reliable, realistic and safe solutions for the modern type of live hot fire training systems. These systems replicate safely and realistically any kind of fire, fully controlled for the utmost safety for both trainees and instructors.

> *The new range of PLC- or computer controlled, gas fuelled hot fire training systems offer the optimal training platforms for any kind of fire training allowing fire-fighters to effectively achieve all hot-fire training objectives.*

These systems are available for:

- Structural Fire Fighting in buildings
- Industrial Fire Fighting
- Military Fire Fighting
- Aircraft Fire Fighting
- Crew Training
- Special Applications like Tunnel Fires, Forest Fires, Offshore platforms etc.

SAFETY FEATURES

Safety is a key focus when considering live fire training, including fires inside burn buildings, modular systems, and fires inside fully encapsulated rooms, DIN 14097 part 2 is the world leading standard for gas fuelled, live and hot fire training systems:

- **Gas Monitoring Systems** are used for each burn room with at least 2 redundantly operating gas sensors or gas sampling systems. Typically 2 alarm settings are configured: At 10% LEL, automatically causing the ventilation system to provide fresh air; At 25% LEL (or in some areas at 35% LEL) all gas and smoke production is stopped immediately and the

d Safe Live aining

Picture courtesy of Draeger Safety

ventilation system runs on full purge.

In all adjacent rooms to the active burn room or in the technical rooms, at least one gas sensor is also installed to further enhance safety.

- **Ventilation System, which provides cold combustion air for the fire,** places and fire rooms, and which provides in case of an emergency full purge of the relevant fire room, with a purge rate of at least 80 times the room volume.
- **Temperature Monitoring System, which** automatically shuts down the system at temperatures of 250°C in one metre room height. This figure was taken into the standard to protect trainees during a live fire trainee from injuries in case they panic and stand up. In such a case, temperatures above 250°C would melt the facemask and/or face shield.
- **Pilot Flame Management System, which** continuously monitors the pilot flame. In case of a failure, all gas supplies will be shut down automatically from the operating system.
- **Pilot Gas Supply and Pilot Combustion Air Supply are separate from Main Gas Supply and Main Combustion Air supply,** meaning that we have independent systems.
- **Smoke Production** must be created by non-toxic and environmentally safe smoke fluids, which are also biologically degradable. The smoke and the smoke fluid should not interfere with the operating system, nor cause any harm to the system's operational parts.
- **Emergency Stop Buttons** are installed in each fire room at specific locations, so that even collapsed people who fall down can reach the button. Also each pendant and on the control console in the control room an emergency button is installed. Pushing a button causes the system to immediately stop all gas and smoke supplies and run the ventilation system on full purge. All systems include local and remote safety shutdowns.
- **Refractory Material.** Each burn room of the construction has to be protected against heat and flames and the thermal shock, which is caused when applying cold water to the heated up surfaces. Modern cladding is either made of Cot-Ten-Steel, a steel type, which absorbs best the thermal shock, or special firebricks.
- **Certified System.** All modern live fire-training systems have to be approved by an internationally recognized testing institute or laboratory, such as TÜV etc. A certificate from this authority must be an initial part of the documents, delivered with the system.
- **Training and Trouble-Shooting.** The manufacturer must provide a training to the instructors of the end-user which contains of instructions for use and operation, trouble-shooting and the special behaviour of gas fires simulating all fire classes, A, B and C.

The previously mentioned standard DIN 14097, part 2, the standard DIN 14097, part 1 – the construction of fire houses – local standards for gas and electrical installations and NFPA regulations NFPA 1402, 2002 edition – guide to building Fire Service Training Centres, NFPA 54 and NFPA 58 and

> *Safety is a key focus when considering live fire training, including fires inside burn buildings, modular systems, and fires inside fully encapsulated rooms, DIN 14097 part 2 is the world leading standard for gas fuelled, live and hot fire training systems*

Realistic and Safe Live Fire Training

Picture courtesy of Draeger Safety

NFPA 86 used in combination provide utmost safety and reliability of the delivered system.

PLC CONTROLLED SYSTEMS

With a PLC-controlled system, all operations of the system are handled by a PLC. The integrated safety features are automatically controlled by the system. The smoke production, the choice of the fire places and the fire sizes, however, are manually controlled and operated by the instructor. He decides whether the trainees have fought the fire in a correct and proper way, whether they have used the right tactical strategies and whether they have applied the right agent and the right amount of agent. With his manual controls, the instructor can increase and decrease the flames, he can set up single- and multiple-fire scenarios and he can reduce smoke or he can increase the opacity level.

COMPUTER CONTROLLED SYSTEMS

Such a system is an upgrade of a PLC-controlled system. Fire Scenarios and Fire Scenario Parameters can be pre-set to run on automatic modes. These functions are available for single and multi-fire scenarios.

The computer workstation and operating software inside a control room allows the pre-setting of the following variable parameters:

- Flame height above the prop: from 0–100%. Depending on the education level and experience of the trainees this feature can be set up. Together with the client, the supplier sets up these features during the commissioning and training phase. Besides the flame size in per cent also the duration of the burning flame can be pre-selected.
- Flame developing time in seconds, by steps from 1 to X seconds. According to the experience level of the trainees performing such an exercise, for the first time they may require a longer time to prepare themselves compared to those who have already been in a fire room. The duration of fires and exercises can be adjusted individually.
- Flame spread in seconds by steps from 1 to X seconds.

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tyco Fire & Security

> *The main goal: effective training under the highest safety conditions for trainees and instructors, realistic scenarios and reliable training strategies that can be tailored to each customer's needs.*

- Extinguishing method, time and temperature dependent. However, this feature the supplier configures within the software within a value of multiple features. It makes no sense to detect a successful session just by one of these figures. Reality tells that only if a certain temperature drop within a certain time and with the application of a certain amount of extinguishing media is detected, a realistic detection is given. Otherwise, if only temperature drop or amount of agent or time is detected, non realistic data will conclude a training session as successful when it was not.
- Extinguishing temperature, as the chapter before, set up from min. X° Celsius to max. °C above the prop and within the room.
- Watering time after fire is extinguished, as above.
- Re-ignition time in seconds from 1 to x seconds in steps.
- Smoke status, as shown previously on the smoke pre-selection screen, with the effect of a smouldering fire and smouldering time.
- Chain reaction, operation of various fire places in a row.
- Time delay from one fireplace to another fireplace.
- Touch screens on control console for immediate demands for the system.
- Simple symbols for repeated demands and for alarm signals and messages.
- Acoustic warning system in case of wrong operation, message flashing.

Storage of other operating data:

- Which operator was where at which time and for how long on duty.
- Record of operating faults, to be visual only with key lock for certain persons.
- Instructor at site, duration of training sessions.

CUSTOMER TAILORED SOLUTIONS

As a conclusion, gas fuelled, PLC and computer controlled hot live fire training systems offer various advantages compared to conventional training methods, including safety and environmental compliance.

The main goal: effective training under the highest safety conditions for trainees and instructors, realistic scenarios and reliable training strategies that can be tailored to each customer's needs.

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Thermal Imaging Cameras in Asia/Pacific Region

DEPENDING ON WHOM YOU believe, the worldwide market for non-military/security thermal imaging cameras is about 7,000 units annually. The supposed breakdown is approximately 4,500 cameras in North and South America, with North America accounting for the vast majority of sales. The rest of the world accounts for about 2,500 units. If we assume, for the sake of argument, that Europe takes up about 1,000 units then this leaves 1,500 to be divided up among the rest of the world outside America and Europe.

By James Moloney,
Manager, Sales & Marketing
Asia/Pacific Region
GB Solo Ltd.

Picture courtesy of GB Solo

WHO IS USING THERMAL IMAGING IN ASIA?

Does anyone know how many cameras end up in Asia/Pacific region? One thousand is probably a safe guess, maybe a little on the high side. So, who is buying the thermal imaging cameras in this region? Well, we can probably account for about 20% of units in the diagnostic marketplace and maybe another 5% in the thermal mapping market, leaving about 750 cameras for the fire fighting sector. This probably represents a dollar value of about US$10,000,000.

Traditionally, civilian fire brigades in the more sophisticated markets such as Australia, New Zealand, Singapore, Taiwan and Malaysia have accounted for the majority of sales, but that seems to be changing. Chinese provincial fire departments have been on a spending spree in 2003/2004, intent on equipping their fire departments with the latest technology.

WHAT DOES THE END-USER CUSTOMER WANT?

In a competitive market, China is focused on value for money and the low end, no-frills basic camera specification has performed well in the last two to three years. However, China's fire departments have become more aware of the benefits of advanced features such as hands-free cameras, light enough to be worn attached to the fire-fighter's face mask, but with all the features of the more established high-end cameras, including colour displays and spot temperature – but at no price premium either.

Features such as these allow the thermal imaging camera to be used as a tactical fire-fighting tool rather than as an evaluation tool or a "sweep and drop" cameraman tool.

The use of thermal imaging cameras will increase as fire-fighters become confident in the camera's ability to a) allow them to work faster and b) to rescue more victims in a limited amount of time. There are a number of fully featured cameras on the market that can capture images for post-incident investigation, provide sensational colour images and interface with PCs for de-briefing analysis and evidence gathering. Other cameras can provide very sophisticated temperature gradients and a host of features presented on the camera's display. But, at the end of the day, these features add weight to the camera and the question has to be asked – does the

Thermal Imaging Cameras in Asia/Pacific Region

fire-fighter really use these features other than on the training ground?

The reaction of most fire-fighters to being in a smoke-filled environment, unsure of what they will encounter, heart racing, breathing accelerated so that air is used very quickly, is to think "how fast can I do my job and get out of here alive?" Whether trying to locate the seat of a fire or a victim in danger of death from smoke inhalation, the fire-fighter wants to be able to see the target, be aware of any threats to safety in his immediate environment, and find his way out once he has finished his task.

The ability to use both of his hands, while still having a clear view of his environment and his intended target, means he can work at least twice as fast as he could if using only one hand, while holding a thermal imaging camera in the other hand. This means he gets himself and his victim out of danger faster. If you give him the option of a fully-featured camera that he has to hold in one hand, or a camera with enough information to get the job done quickly, with both hands free to work, he will invariably choose the latter.

Face-mask mounted thermal imaging cameras and helmet-integrated cameras have enjoyed significant success in the last two years in the Asia/Pacific market and this success looks set to be repeated again in future years.

China's fire departments and Military, the Malaysian Navy, Singapore's SCDF and D.A.R.T. and, very recently the Singapore Navy, have all invested in these types of camera. Korea's civil and private industrial fire brigades have been using these types of camera for more than three years now.

A number of the more established thermal imaging camera suppliers are being forced to cut margins significantly to compete with the new breed of camera and fire brigades that bought cameras five years ago are now coming around with replacement and upgrade requirements, such that 2005 will see a significant number of users evaluate the performance of their older cameras against the latest technology available.

Picture courtesy of GB Solo

The question suppliers must ask is will the end-user be satisfied with a "stripped down" version of the traditional thermal imaging camera just to save money, when, for only a few dollars more he can equip his fire-fighters with the latest, hands-free technology?

REQUIREMENTS UNIQUE TO ASIA/PACIFIC?

Is the Asia/Pacific market producing any requirements that are unique to the region and where is the end-user hoping to go with this technology?

Apart from the obvious issue of high ambient temperatures and moisture levels there is not much difference in how the thermal imaging camera is being used in Asia compared with America or Europe.

Obvious concerns are the use of cameras in fighting fires in high-rise structures. The tallest buildings in the world are in Asia and fighting fires in these structures calls for a high degree of sophistication.

Increasingly, thermal imaging cameras are being used with wireless transmitters to send real-time images of the fire scene to the Incident Commander.

However, most thermal cameras employ only small in-built transmitters capable of sending a clear picture about 100m-200m with line of sight between the transmitter and receiver. What happens to your picture transmission when the fire-fighter is 40 floors above ground level trying to locate victims of smoke inhalation? Or when he is in a train tunnel? These in-built transmitters do not have the power to provide reliable images to the Incident Commander. To provide greater transmission power the camera's transmitter must be larger than the in-built variety.

Manufacturers are moving to belt-worn transmitters powerful enough to send a clear picture up to 1Km line-of-sight. This technology will allow thermal imaging cameras to send crystal clear, rock-solid pictures from as deep as five floors underground to as high as the top floor of the Petronas Twin Towers – something never dreamed possible using analogue transmission technology.

SCBA manufacturers are also interested in this technology for their own telemetry transmission and those with vision can see the day when the BA set will be provided with full digital transmission of the distress signal along with all other telemetry functions. Interspiro of Sweden was the first BA manufacturer to provide electronic telemetry on its BA equipment and Andy Morrison, Regional Manager of Asia Pacific for Interspiro believes "the day will come when every function of the BA set will be available to the fire-fighter on a heads-up display, combined with a thermal image – and all of the data will be available to the Incident Commander, and using digital transmission technology distance or interference will not be an issue".

We live in hope that no fire-fighter in Asia, or anywhere else for that matter, will find himself fighting fires 40 floors above ground or five floors below ground, but, because there are many, many buildings in Asia where this is a possibility the equipment manufacturers must continue striving to provide high technology solutions to these events. Combining thermal imaging and digital wireless transmission with SCBA telemetry seems an obvious route to providing the fire-fighter with a safer working environment.

With all of these sophisticated solutions emerging, how are the manufacturers supporting their products in the field in this region?

HOW COMMITTED ARE THE MANUFACTURERS TO THE ASIA/PACIFIC MARKET?

Most thermal imaging camera manufacturers are based in the USA and/or the United Kingdom. Doing business in Asia from either of these manufacturing bases is difficult. There are differences in business culture, not to mention significant time differences, to be overcome.

One often wonders how serious the manufacturers are about the Asia/Pacific market, especially when it comes to providing warranty support for the cameras they sell. Thermal imaging cameras are too costly for fire brigades to purchase an extra one or two to provide back-up in case of a warranty failure. However, it is vital that the user is not left without cover if a camera needs to be repaired.

The British manufacturer, GB Solo Ltd., has had an Asia/Pacific base for three years now, in Kuala Lumpur. This base provides sales support to the regional distributor network and also stocks spare cameras and integrated thermal imaging helmets to provide 24-hour turnaround of warranty repair cameras. A replacement camera can be shipped to any location in the Asia/Pacific Region within 24 hours, thus ensuring the

Picture courtesy of GB Solo

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Another manufacturer, Bullard Inc. of the USA, established a regional sales office in Singapore in 2004 providing sales support locally.

Apart from these two manufacturers, the remainder are all represented in some form or other only by distributors or agents with in-country responsibility. The distributor and end-user needs to rely on the home manufacturing base for support, which can often lead to logistical problems with warranty and repair issues.

In this increasingly competitive market the manufacturer needs to employ every tactical advantage possible to win the confidence of the end-user. Apart from competitive prices, the end-user wants a reliable, fully featured product with a good support network.

Very few manufacturers are providing this level of service in Asia/Pacific Region.

Developers in Europe and America are re-considering the appeal of high-rise structures and sentiment is moving towards lower risk smaller buildings.

The Asia Pacific region, however, is expanding again at a significant rate. Malaysia's Twin Towers are no longer the highest buildings in the world, having been surpassed by a new single tower in Taipei, which in turn will soon be overtaken by another in Shanghai, if not Dubai. More and more high-rise structures are being built; longer and deeper SMART tunnels are being built; the regions sea ports and airports are expanding at unprecedented rates to cope with increases in traffic. An Asian airline, Singapore Airlines, will be the launch customer for the world's biggest airliner, the Airbus A380, in 2006. With the increasing scale of structures and facilities, so also increases the risk of a catastrophic fire in one of these structures.

The regions fire departments must equip themselves with the latest proven technologies to help tackle fire in these new buildings and so the equipment manufacturers must also move with the times.

Thermal imaging as a firefighting and rescue tool must continue to evolve to meet the demands of the region's fire departments – and maybe, just maybe, Asia will also end up leading the way in the use of this technology.

Picture courtesy of GB Solo

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PPS
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How a new Professional Protection Systems' Range is meeting the new challenge of surge capacity

"Surge capacity" has nothing to do with flood control or electricity generation. It is the latest preoccupation of emergency planners concerned with planning for the mass decontamination and treatment of casualties after a CBRN incident. The challenge is to ensure that in the immediate aftermath of an incident the response has the potential to deal immediately with large numbers of casualties, pre and post decontamination, whilst keeping contamination localised. This capability is known as "surge capacity".

Already established as one of the world's leading manufacturers of decontamination technology, supplying emergency services in 65 countries, Professional Protection Systems claim that their success is based upon listening to the needs of both the managements and practitioners of those services and then addressing those needs. The surge capacity factor is the latest issue that PPS has addressed and the result is a new product, complimenting the company's existing mass decontamination showers, both inflatable and metal framed, a range of isolation shelters varying in configuration and size.

The new range is based upon the same articulated metal frame technology as the mass-decon units supplied by PPS to the UK government's terrorist response programme, with the big difference that these new units are all self-contained isolation chambers. Their fabric covering is chemical resistant and features an integral zippered five-foot airlock with a specimen pass through port. These units also offer double zippered pass through slots. The interiors also incorporate sidewall and overhead attachment points for monitoring equipment and incorporate snorkelled ductwork for the filtration unit. Choice is one of the key features of the whole PPS portfolio and the filtration unit is no exception. There is a choice of four particulate filtration and chemical/biological filtration systems that deliver at 400 CFM (cubic feet per minute) and 1,500 respectively. Both compare well with the recommended minimum flow rate of 300 CFM.

Standard windows on each side and double end viewing portals mean that if necessary patients can be monitored externally at all times. The new PPS isolation shelter is suitable for a wide range of applications- from triage chamber to intensive care unit. Like all PPS products it deploys easily and can be erected and ready for action by a two-man team in minutes. Also like all other PPS products these new surge capacity units come accompanied by a vast range of accessories, some familiar but some completely new, like a casualty transport pod that is in effect an isolation shelter on wheels. This is capable of moving a contaminated subject from one isolation unit to another without risk of cross contamination en route. The point about the vast range of accessories is that it ensures that by specifying PPS equipment it is possible to enjoy a degree of customisation impossible from any other manufacturers.

According to PPS Managing Director, Mark Whitcher, every incident plan should now recognise surge capacity and factor it into the equation. "To fail to do so" he says, "could not only mean leaving casualties untreated for too long but could lead to, at least a localised, break-down in civic order. This could then only be restored in that kind of crisis situation by resorting to the most draconian measures".

In addition to its metal-framed products PPS also offer a range of inflatable units, making it the only manufacturer in the world offering the choice between the two systems. This plus a comprehensive range of high class PPE, ranging from chemical splash suits to particularly high spec units made for the world's nuclear industries, assures an objective assessment for every customer related to both needs and budget.

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Selecting Outside Tra Maximize Your In-Hous

Pic courtesy of Fire Science Academy

By Mitchell Baclawski, Assistant Director for Off-Site and Consulting Services, University of Nevada, Reno Fire Science Academy

MANY EMERGENCY RESPONSE TEAMS, whether they are volunteer, paid, industrial or municipal, can improve their state of readiness by expanding their in-house training programs through the use of outside training providers, a strategy which offers benefits and some risks to the hiring organization.

One of the perceived solutions to increasing responder safety and performance is to spend money on equipment. Monitors, power saws, lifting bags and other specialty appliances are found in the apparatus of most responding organizations. Often what is not found is recurrent training to use these tools effectively. How does this happen? Normally the customer receives initial training on equipment from the vendor, provided free to an organization's training specialists along with the OEM manual(s). Training specialists then train the ranks to an acceptable level, but occasionally the full advantage of the new equipment is not fully realized.

Another problem is that equipment may be thought of as independent of other more primary equipment on an apparatus. Consequently, not until a response drives the need to use multiple pieces of equipment does the need for training on all components of the apparatus become apparent.

BENEFITS OF OUTSIDE TRAINING PROVIDERS

There are benefits to having an outside training provider involved with your program. We are creatures of habit and we develop distinct habits, good and bad, over the years. By incorporating and infusing new and different ideas and pushing our goals we are able to grow and advance.

Some training providers are adept at identifying program strengths as well as areas to improve. This can be valuable when seeking a challenge for seasoned responders. This is also of value when developing more complex programs that require using your resources, appliances and apparatus to their fullest capacity. Instruction-driven training is much more effective and desirable than the outcome of a response-driven incident.

Outside training providers also may be able to introduce new methods for using your present equipment. Without a doubt, training with the equipment you actually use is a benefit of in-house programs. You may learn a new way of using the tools you have, and you may also recognize deficiencies in your inventories.

Training providers also can introduce new equipment and suppliers to your organization, and equipment and product suppliers can be a valuable training resource. Some of these suppliers may work with training providers who can introduce new and advancing technologies to your group. Some training providers may also have fixed facilities where suppliers test and evaluate their products. This can be an excellent opportunity for response organizations to give their input into refining current appliances as well as emerging technologies.

A few large, institutional training providers offer programs and consulting to sanction and certify existing in-house programs. These providers examine a company's goals, existing training plans and in-house training teams to evaluate their overall training program. The results of this evaluation can form the basis of an organization's new written training plan, which can then be sanctioned, including an implementation strategy and control measures established by the sanctioning institution. Control measures monitor the new written training plan and, along with program documentation, validate the in-house program to the institutional standards of the academy or institution. This third-party validation provides different benefits in different locations and may include valuable continuing education units or CEUs granted by the sanctioning university or academy.

UNDERSTANDING YOUR CURRENT PROGRAM

To contract effectively with a training provider to augment and complement an in-house training program, it is essential to take the time to understand your training program and then to devise a plan. Are there long term goals; are there enabling objectives or short-term goals; does your tactical training plan complement these goals; who is currently providing the training and who recognizes these efforts? After you have a breakout of your program place a value on the components identified and prioritize the needs. This work should show which part of the in-house program needs attention.

When investing in a training provider it is important to research potential providers and to determine what services you want them to provide based on your needs. Characteristics in a qualified provider are no different from what you would want in your in-house training program; look for qualified, certified, experienced and reputable providers.

When you are investing in a training provider ask what particular providers can add to your program. How do they serve your needs? What qualities do they have that complement your in-house program and its goals? If your in-house program only seeks to achieve compliance with required standards and legislation you will probably want a certain kind of provider different from one who provides training to establish the new standard.

Also consider a provider's technical qualifications; never assume and always

ining Providers to e Training Programs

Pic courtesy of Fire Science Academy

check. The most personable hazardous materials instructor may not be qualified to assist you in developing an annual training plan. Find the provider with the best ability to meet your needs.

Be sure the provider is staffed to a level that will accomplish your goals. Training is an investment and it is preferable to have a quick return on your training dollars. As you look at your priorities be certain providers can work at your schedule, not theirs.

Providers should be accredited or approved to supply the services requested. Check to see whether the provider has certification from recognized boards such as the National Board on Fire Service Professional Qualifications (Pro Board) or International Fire Service Accreditation Congress (IFSAC). Approvals may also come from technical committees, advisory or review boards and trade organizations. Also consider whether the programs are in line with accepted consensus standards or practices. Consensus standards are set by many entities. In the United States they are established nationwide and/or statewide by federal and state bodies such as the Occupational Safety and Health Administration (OSHA), the Mine Safety and Health Administration (MSHA), the Federal Aviation Administration (FAA), the U.S. Department of Transportation (USDOT), the National Fire Protection Association (NFPA), and your own state's Fire Marshall. The bottom line is that you work under the scrutiny of outside agencies and regulations and your training provider should too.

Take the time to ensure your training provider is reputable. You can start by asking the provider for references and recommendations from others. A little serious checking on your part should quickly give a fair indication. Is this provider highly regarded by, well thought of and in good standing with others within the field? Have words such as trustworthy, sound, honest and reliable been used to describe the provider? No doubt you have found that emergency services are usually a tight-knit group, and word-of-mouth references are often available.

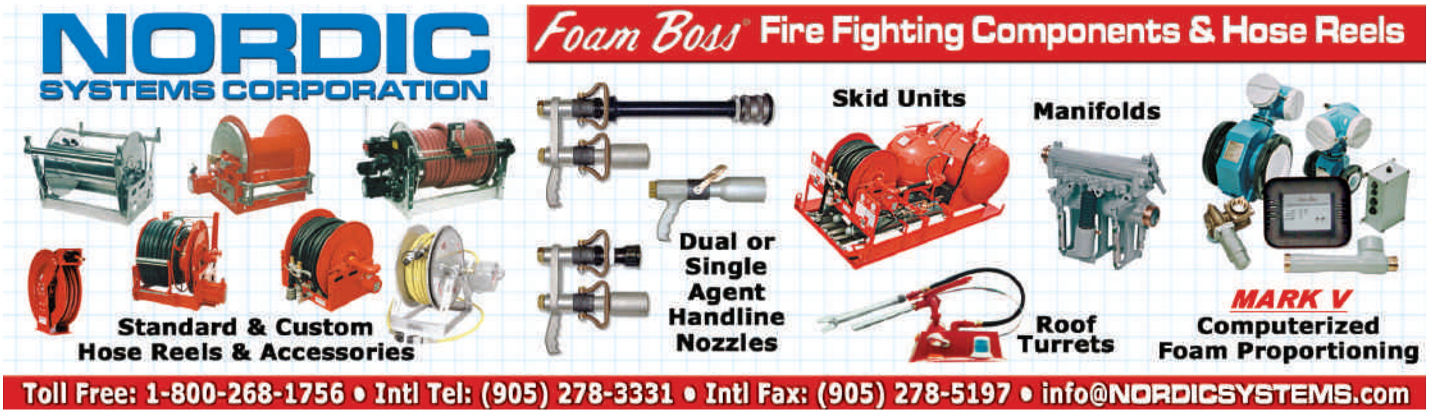
SUMMARY

In-house training programs represent the largest number of student contact hours in emergency response training. At times these training hours may not be invested to their full potential. Outside training providers can often increase the value of this investment. Training providers can be a benefit by assisting in the evaluation of your current in-house program and providing services that advance that program. There is a risk from not carefully choosing the outside provider right for your needs. The risk can be minimized by:

- Fully understanding your current training goals and plan
- Defining and prioritizing your needs
- Researching and reviewing provider qualifications
- Evaluating the provider's staffing levels and availabilities
- Checking for third-party accreditation and approvals
- Conducting thorough reference checks

By following these steps, defining your needs effectively and investing the time and resources necessary to enhance and maximize your training program, your outside training provider and your in-house training program will most certainly become a great team.

Mitchell Baclawski is the assistant director for off-site and consulting services at the University of Nevada, Reno Fire Science Academy (FSA), which provides training to hundreds of companies and organizations at its state-of-the-art campus in Carlin, Nevada, as well as worldwide. For more information about the FSA, visit: www.fireacademy.unr.edu, call 1-800-233-8928 or (775) 754-6003, or email: mblawski@unr.edu



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Dedicated cutter and spreader or the noble combi-tool

By Brendon Morris,
Instructor Technical Rescue at
Holmatro Rescue Equipment,
the Netherlands

Cutting a C-post with a CU 3040 NCT Holmatro® cutter

THERE IS MUCH CHOICE in the market of hydraulic rescue tools and this is not a bad thing. The variety of equipment available allows one to make the best choice for your given environment. Just as every rescue scene is different so too are the needs of different rescue services. While the core requirements may be the same there are other factors that make every rescue service's needs unique. These factors include, but are not limited to, geographical environment, nature of risk prevalent in your area and of course budget. One decision that will have to be made is whether to go the route of the dedicated cutter and spreader and/or the combi-tool. In this article I will take a closer look at some of the issues to consider while making this decision.

The first thing worth mentioning is that in the last few years things out on the road have changed. The era of new car technology is upon us and this dramatically affects our decisions regarding hydraulic capacity. I do still believe there is a place for the noble combi-tool in the extrication arena. I just feel that this has changed slightly. The advent of new car technology means that it is likely that the cars we come across in daily extrication incidents will be of a construction that challenges the cutting ability of the combi-tool. This is not because a combi-tool is flawed in design; on the contrary, combi-tools are a great combination of cutting and spreading equipment in one. The reason combi-tools will not necessarily perform well on new technology vehicles is for example due to the shape of their blades. In the same way that a more general purpose cutter with its long straight blades does not always do so well on the strong construction found in new cars, so too does the blade design of a combi-tool not always allow for the best cutting performance. In comparison specialised NCT (New Car Technology) cutters with their characteristic 90° angle U-shaped blade design are more effective at cutting this sort of construction.

> *The advent of new car technology means that it is likely that the cars we come across in daily extrication incidents will be of a construction that challenges the cutting ability of the combi-tool.*

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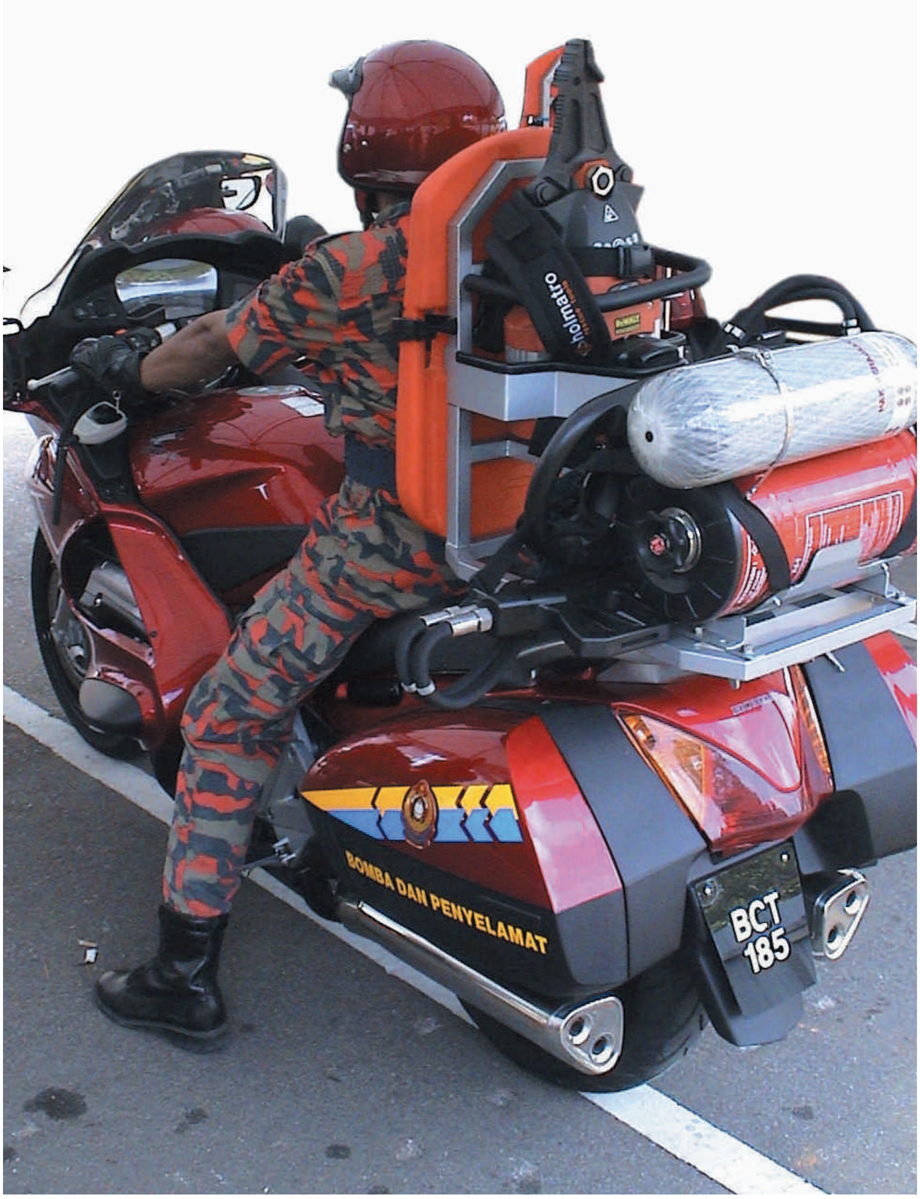
In terms of spreading we need to consider the following issue. The hydraulic mechanism of combi-tools means that they are more effective at directing their hydraulic force towards cutting or squeezing and less so for spreading. This is due to the fact that combi-tools make use of a central bolt construction. This does not mean that combi-tools are no good for spreading. They are very effective at spreading but not as effective as a dedicated spreader. In many vehicle rescues this will not be a major concern and is certainly not as much a limitation as the decreased cutting ability of a combi. However, when you do need that added capacity or ability of a dedicated spreader you better hope you will have one available. Good spreading capacity is also very important for other rescue disciplines such as USAR.

Combi-tools may seem to be inferior to a dedicated cutter and spreader but this is not the case. Combi-tools simply have other advantages that make them a great addition to the rescue equipment you are carrying. One factor to consider is the availability of carrying capacity. We would all like to have every piece of equipment we could ever imagine needing. This is however not possible as we have to get it all onto the rescue unit. New advances in equipment technology mean that we can carry equipment that weighs less yet does more. A perfect example of this is what I would carry in my operational days as opposed to what I would have to carry nowadays for the same rescue capacity. For example in my one-man unit I used to carry a small combi-tool, a length of hydraulic hose and a foot pump for extrication. Together this would probably weigh approximately 25 kg. Nowadays I could replace this with one extremely compact yet full-capacity battery-operated combi-tool weighing less than 15 kg, battery and all included. This is beneficial for limited space on the rescue truck and for any means of transport where space is limited like motorbike rescue units, but it also helps when you have to carry the equipment long distances on foot.

In conclusion the equipment you choose should meet the needs of your



Use of a battery-operated combi-tool on a motorbike

rescue squad and be as flexible as possible in terms of multiple applications. Equipment should not be too complicated and lead to extensive training to ensure safe operation. Remember always choose an over-spec. tool for that "other job" rather then an under-spec one. This is the safer approach. Professional tools of the trade are always a large investment. Most hydraulic rescue equipment that you will buy is also going to be a large investment so it is essential that the right choices be made to ensure that every valuable cent of your rescue tool budget is well invested. This will ensure that your team is as effective and efficient as possible. Unfortunately, no ideal list of the perfect set of equipment to have on your rescue truck exists. As mentioned earlier, depending on what the bulk of the risk is in your area this will heavily influence what equipment you will carry. Further to this, different rescue teams or organisations have different responsibilities in one geographic area. This also leads one to need different equipment. All in all the best choice is the choice that provides you with the flexibility you need while having the capacity required.

Brendon Morris is Instructor Technical Rescue at Holmatro Rescue Equipment, based in the Netherlands. His responsibilities include training Holmatro® users and dealers worldwide on best rescue practices, as well as researching rescue disciplines to ensure that Holmatro keeps pace with future rescue needs.

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The Cost of

– fire-fighters often ‘out-

Picture courtesy of Safety Equipment Australia

By Torbjorn Lundmark

PRACTICAL EXERCISES IN ACTUAL work situations show that up to 70% of a fire-fighter’s breathing requirements are well above the levels at which respirators are tested.

The studies serve to confirm a situation that has been known for some sixty years, but is rarely discussed or referred to.

The research projects also reveal that many respirators – although they comply with various Standards – are simply incapable of satisfying users’ actual demands for air. Such devices do not allow a wearer to breathe normally at work.

The tests, conducted in Australia over two years, were prompted by the events following the September 11 disaster at the World Trade Center in New York. Rescue and recovery personnel, issued with industrial respirators, could not perform their required tasks, chiefly because they could not draw enough air through the filters to satisfy the body’s need for oxygen during hard manual labour.

Even more worrying, human breathing makes it easy to out-breathe a filter respirator even during moderate work activities. Potentially serious deficiencies were discovered in many types of breathing protection equipment, and it has been established that it is not only fire-fighters working under extreme pressure and great workloads that experience inadequate air supply: just about any worker can easily out-breathe the equipment while performing normal routines.

SCBA v. AIR-PURIFYING DEVICES

The fire-fighter at the bottom of a burning high-rise building is often on the horns of a dilemma. On one hand, air cylinders on your back mean a very high protection factor in just about any type of atmosphere. But then there’s the weight and the limited duration of operation. Once you have climbed to the top, will there be enough air left to do any work before it’s time to change cylinders or go back down?

On the other hand, efficient air-purifying respirators might give enough protection – but will the filter let you breathe all the air you need during the climb and the work?

Picture courtesy of Safety Equipment Australia

UNADDRESSED ERRORS OF THE PAST

There are big differences between the various conditions a respirator is subjected to in the test laboratory and the performance required of it in a real work situation, and this has been known for a long time. For instance, the air flow rate used in standards testing dates back as far as the First World War, when it was believed – wrongly – that humans breathe on average a volume of 42.5 litres/minute. Since our lungs spend half of the time inhaling and half of the time exhaling, the experts said, the speed of the air as it travels through the mouth must be twice the volume, that is, 85 litres/minute. This has since proved to be far from true.

Only twenty years later, during WWII, the noted Dr Leslie Silverman from USA found that people breathe at much higher flow rates, and that the speed of the air flow is not double the volume inhaled, but more like 3.5 times greater. A respirator must be able to let this great flow of air through; otherwise the user will not get the required volume of air. Either the wearer will have to stop working, or the respirator will start to leak. He stated officially that the test flows were unrealistically low, and should be lifted.

But this raising of the standard never happened.

The mystery that baffles many modern researchers and manufacturers of superior-performance respiratory equipment is why – now that we have the

the Climb

-breathe' their respirators

Picture courtesy of Safety Equipment Australia

technology and know-how to make filters and cartridges that can satisfy human breathing without cutting corners on efficiency – the Standards have not changed enough to even approach any semblance of actual human breathing.

Numerous researchers complain that the testing is still done according to sixty-year-old methods. The result is that many air purifying respirators are still made and used today that will never be able to live up to the requirements of real life. This was "sorely and sadly demonstrated on 9/11," according to one respiratory protection specialist.

STAIRWAY TO THE TOP

After the many stories of failing breathing protection after the World Trade Center disaster, the Australian branch of a respiratory protection manufacturer, The S.E.A. Group, became interested in establishing the actual breathing requirements of a fire-fighter hard at work. It was decided to device a real-time, real-work method of plotting or monitoring a fire-fighter's breathing pattern during a climb similar to that attempted on September 11, 2001. For this purpose, the company hired the fire stairs of a Sydney high-rise building and conducted an experiment in which a dozen people were required to dress in fire-fighter's turnout gear and climb the stairs of 25 floors, carrying customary weights such as fully charged fire extinguishers.

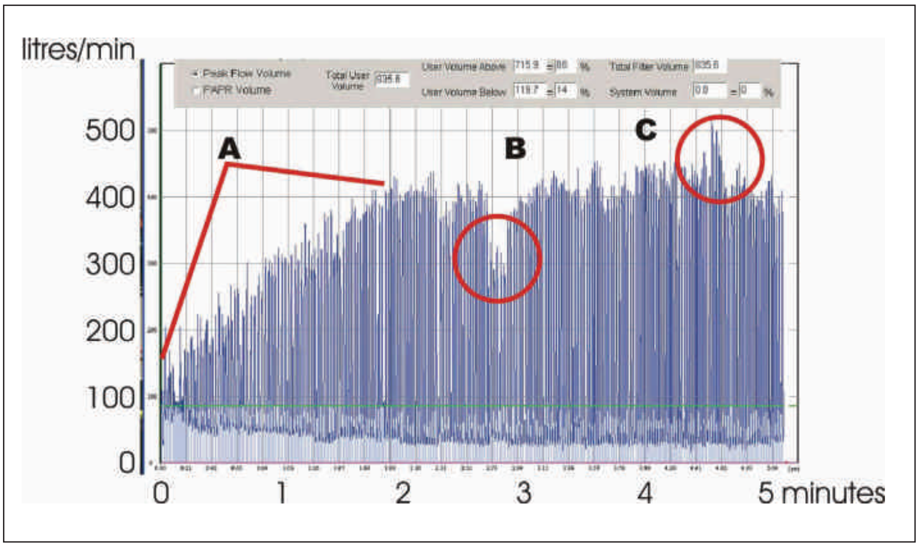
Each climber's breathing was measured during the entire exercise, and later processed to give a detailed picture of the breathing pattern and air requirements. This was done by using a device called a data-logger; a device that made it possible to measure the volume, speed and timing of every single breath, at a frequency of 50 times per second. This generated a massive amount of information which was later analysed, compiled and plotted on graphs.

The results were surprising. All of the test subjects reached peak breathing rates of four times the flow rate of NIOSH-stipulated Standards testing. The experiment comprised both male and female test subjects of widely differing age, fitness level, and body weight.

When this information was presented to various organisations, such as standards authorities and other government bodies, it aroused more than casual interest. However, it was generally believed that the results might not be truly representative, as "real" fire-fighters would presumably be fitter, more trained, and more used to the work load, and the climb would be performed in a calmer, slower, more deliberate way. In short, sceptics opined that a fire-fighter would breathe in a more professional way, and therefore make better use of the available air.

In compliance with the comments, the entire exercise was repeated, this time in cooperation with the city fire department, and using professional fire-fighters from the Sydney section of the NSW Fire Brigade.

Some were surprised to find that the results concurred with the preliminary test five months earlier. There was little difference in the breathing patterns of the participants: the fire-fighters breathed as much air, and as rapidly, as 'non-professionals'.



A. The heart and lungs start to work hard very quickly. The breathing rate reaches its peak already in the first 1.5–2 minutes of the climb.
B. A brief rest stop has a quick and profound effect on the breathing.
C. In the final thirty seconds of the climb, some participants reach peak inhalation air flows of 500 litres per minute or more.

Picture courtesy of Safety Equipment Australia

HUMAN BREATHING

Climbing 25 floors with around 25 kilograms of clothing and equipment is extremely taxing on the body. In addition to the physical work itself, fire stairs are often hot and, perhaps, not very well ventilated places.

One feature common in all participants was that the lungs reached their peak cycle very early in the climb. In less than a minute, all the climbers' breathing became deep and rapid, reaching peak inhalation air flows (that is, the speed at which the air travels near the mouth) of around 400 litres/minute. After reaching the peak breathing rate, the lungs kept up this work for the rest of the climb, which amounted to an additional five to seven minutes.

CALL FOR CHANGE

More and more people concerned with breathing protection are becoming of the opinion that respiratory equipment is not tested at realistic levels. Even the doubters are starting to come around when they see such results as on average, two-thirds of a normal person's breathing travels faster through the mouth than the usual air flow rate used in standards testing.

This, say some, means that it is impossible to tell whether a standards-approved respirator will actually be able to do what it is supposed to do during real work.

Further laboratory testing has uncovered some disturbing news; for instance, that many respirators seem to have been manufactured just to pass the standard – not to be used in real life. When tested at flow rates higher than 85 litres/minute, these respirators failed miserably. The breathing resistance became so high that no hard-working person – fire-fighter or not – would be able to breathe through the mask.

REACTIONS

The response and interest from both American and European standards organisations, fire organisations, defence forces and other operations concerned with fire fighting and the difficult working conditions of fire professionals have been very positive overall. Of late, some American standards have been adjusted, and new standards are on the way for homeland security and domestic preparedness equipment.

However, it seems a long while before we will see a standard anywhere in the world whose testing methods better reflect the way a fire-fighter at work actually breathes. The most promising prospect, perhaps, might come in the form of ISO's 'fit-for-purpose' way of thinking.

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Fire Fighting Foams & Equipment

Foam Proportioning Technology Today

By Dominic Colletti

This is a close-up look at the rotary-gear foam pump found in the Hale FoamLogix direct-injection foam proportioning system. Notice that the gear set to the left is used to pump the foam concentrate, while the pair of gears on the right measure foam pump output. Rotary gear pumps are key technology in pumping high-viscosity Class B foams used for flammable liquid fire suppression.

FOR MOST FIRE BRIGADES located across Europe, Asia and the Pacific, when it comes to fire loss, Pareto's Law – sometimes called The 80/20 Principle – holds true; a minority of inputs lead to the majority of outputs or results. Thus in many fire districts the majority of the fire loss (expressed in dollars) in a given year is generated from a small percentage of the total number of fires. In most cases, structure fire makes up the majority of fire loss while also causing the most pain, suffering and disruption to the residents living and employment conditions.

One tool that has arrived on the scene over the last two decades, Class A foam, has shown to have positive impact in reducing fire loss while increasing firefighter safety during structure fire suppression. Class A foam is a synthetic detergent foam concentrate that is biodegradable and has been shown to be environmentally friendly.

In this article we will take a look at what this technology can do for you, and the hardware required to efficiently dispense and apply Class A foam. Before we do that, an understanding of Class A foam's benefits is needed. Let us briefly look at what fire brigades across the United States have to say about their experience with Class A foam application in real world fire conditions. The following is an excerpt from a firefighter-training textbook, *Class A Foam – Best Practice For Structure Firefighters*:

"... Please list and briefly explain the positive effects you have found of using Class A foam in fire operations.

- Quicker knockdown of structure fires.
- Quicker reduction of heat – cooler environment.
- Much greater knockdown of fire, ideal for exposure protection.
- Less overhaul mop-up.
- Gives us confidence in leaving the scene.
- Less exposure for firefighters to hazards of firefighting.
- Excellent exposure protection – long and short term.
- Reduction in firefighter fatigue due to reduced suppression time and effort.
- Less water needed . . ."

Summarizing the field results of Class A foam application, flaming combustion is stopped more quickly, overhaul times are reduced, and exposure protection applications have increased efficiency as compared to plain water. Since fire is extinguished in less time, firefighter stress and property damage are reduced. And since less total water supply is used, water damage to unburned portions of the fire building is lessened.

Class A foam is important for the incident commander at a working structure fire. It provides superior fire-stopping power during the window of opportunity, those first few minutes after arrival of the initial, limited, firefighting resources – the personnel, equipment and water supply on the first due engine. This is important to fireground command when a "defend-in-place" strategy must be temporarily used to protect occupants trapped inside a dwelling.

What about the expense involved in implementing Class A foam? The initial investment of acquiring foam concentrate, foam hardware, and firefighter training is well worth cost. Class A foam is an investment for your department. When a cost, like Class A foam hardware and concentrate, can be proven to turn a yield, it should no longer be considered a cost, but rather an investment. This fireground investment provides premium value for the fire brigade and its customers, since it provides significant returns in increased firefighter safety and reduced property damage.

How do most fire brigades become involved with implementing Class A foam technology? One of the easiest ways to implement Class A foam is the adoption of a Nozzle Aspirated Foam System (NAFS). A NAFS configuration typically includes a direct-injection foam proportioning system normally installed in the fire pump discharge piping inside the fire apparatus pump enclosure. This foam proportioning system draws Class A foam concentrate from an on-board storage reservoir. It then precisely injects

Foam Proportioning Technology Today

This electronic foam injection system dispenses foam on the discharge-side of the main fire pump, preventing undesirable contamination of the fire pump and booster tank with foam. The push button display also provides foam injection accuracy down to tenths of a percent.

the concentrate into the fire pump's discharge water stream, creating foam solution. The foam solution is discharged out of hoselines or monitors where, at the nozzle, it is agitated with air to create finished-foam. The finished foam is applied onto the fire.

Increasing numbers of new fire apparatus come equipped with electronic discharge-side foam-injection systems. These systems provide accurate foam injection with the push of a button, are dependable and require little maintenance.

If your brigade is planning to purchase a new structural fire engine and doesn't intend to install a Class A foam reservoir and electronic foam proportioner, you should revisit that decision. Review the facts and data, and perform a risk/benefit analysis of using Class A foam. Its application during a structural fire attack has been shown to reduce flame knockdown times as compared to the application of water alone. Class A foam assists firefighters in getting from point A (an uncontrolled fire situation) to point B (a controlled fire scene).

When planning an installation on your fire apparatus, a direct-injection proportioner can be connected to virtually any number of fire pump discharges you want. New fire apparatus installations normally include designated discharges that are piped in as "foam capable." These typically include two pre-connected hoses or hose reels, a larger diameter discharge and a deck gun. The remaining fire pump discharges are "water capable" only.

How is NAFS-created Class A foam applied? With a direct-injection proportioner installed on your apparatus, you can use a variety of nozzles including smooth-bore, automatic or variable-gallon fog nozzles to apply Class A foam. Smooth-bore nozzles create very little frothing action that produces a wet finished-foam that's excellent for deep seated fire, such as bales of compacted cardboard. Automatic nozzles create a low-expansion sloppy finished-foam that provides good foam adhesion on vertical surfaces during a structure fire attack.

Direct-injection discharge-side foam proportioning systems are available in several foam pump volume ranges and provide push-button foam injection control. Easy push button control reduces pump operator stress to help eliminate error under the demands of fire ground pump operation conditions. Most direct-injection proportioners are engineered to handle Class A and most Class B foam concentrates made for ordinary combustible and flammable liquid fire combat capabilities. They can be installed in new fire apparatus or retrofitted onto existing.

> *When planning an installation on your fire apparatus, a direct-injection proportioner can be connected to virtually any number of fire pump discharges you want.*

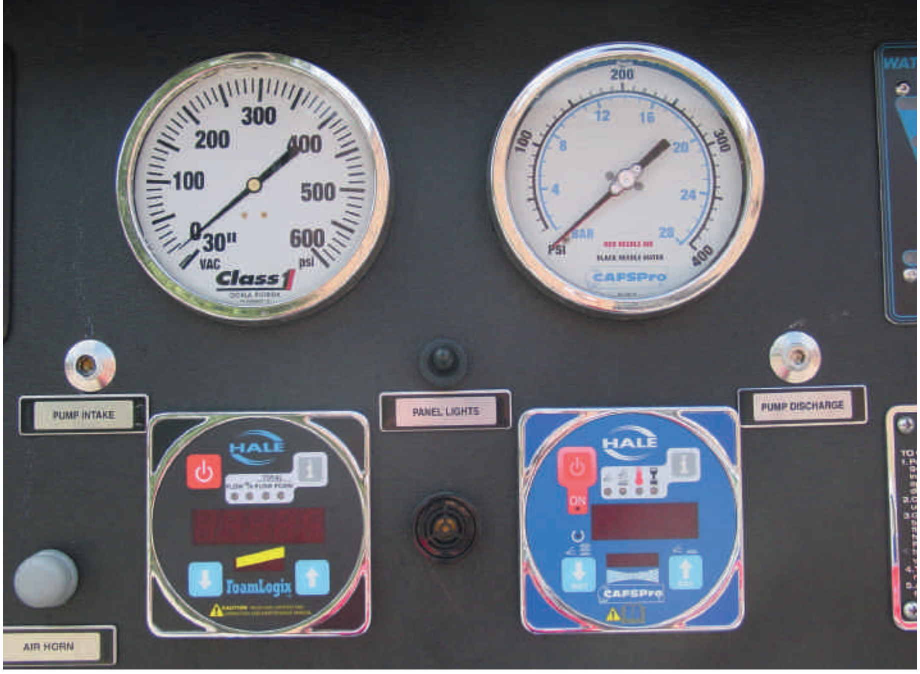
During training sessions, firefighters usually remember and discuss the many limitations found using older style eductor foam systems and ask if direct-injection proportioners have the same limitations, regarding operating pressures, hose lengths and excessive maintenance. The answer is "No." Direct-injection proportioners are built to work with virtually any length and size hose-lay, water-flow delivery rate, pump pressure, and nozzle combination ordinarily found in day-to-day firefighting operations, within the wide window of system capacity.

Training officers like many of the advantages direct-injection proportioners provide – for example, existing brigade protocol for type of fire hose, water-flow delivery rate, etc., typically need not be changed after system installation. In other words, training problems are reduced because little change to standard operating procedures is required. Therefore, after installation, minimum effort in re-training department personnel to effectively put Class A foam to work in fire operations is required.

How do direct-injection proportioners work? Typically a paddlewheel flow sensor is installed in the fire pump's discharge piping to measure water flow rate out of the foam capable discharges. The proportioner system uses rotary-gear pump technology to automatically inject foam concentrate into the discharge side of the fire pump. It injects an amount of concentrate in direct relationship to the water movement past the paddlewheel flow sensor. A microprocessor inside an operator digital display controls all system functions and maintains the operator pre-set proportioning ratio over wide water flow discharge and pump pressure ranges.

What proportioning ratios should be used with Class A foam? When hoselines and monitors are in a direct fire attack mode, pump operators using direct-injection proportioners typically set the operator control display at either a 0.3% or 0.5% ratio. For exposure protection scenarios, it is normally set in a 0.5% to 1.0% ratio range. The ratio used is dependent upon the nozzle type being used and type of finished-foam needing to be produced for the tactical fire application.

What about flammable liquid fires? If you decide to install a direct-injection proportioner system primarily because you are adopting Class A foam, you



This pump panel has an electronic foam proportioner digital display (left) and an air proportioner digital display (right) that work together to provide compressed air foam. A highly accurate foam proportioning is a typical and key component of a compressed air foam system (CAFS). The air proportioner display controls a high-volume rotary air compressor.

should also consider installing dual foam concentrate reservoirs on your fire apparatus. Go ahead and add another concentrate reservoir to hold Class B foam concentrate for suppressing flammable liquid fire (foam reservoirs are normally built as an integral part of the apparatus booster tank in new apparatus). An additional foam reservoir for Class B foam and a dual tank changeover valve will be a minor cost increase in the overall scheme of things. It will however, provide utility during a flammable liquid fire or spill emergency.

Remember that, while direct-injection proportioners are designed to inject small amounts of Class A foam accurately, however, because they use rotary-gear foam pump technology, it can also pump a higher viscosity 3% Aqueous Film Forming Foam – Alcohol Resistant Concentrate (AFFF-ARC). Having an alcohol resistant foam capability on your apparatus is an important feature, especially when trying to tackle a bulk fuel truck accident involving an unignited gasoline spill containing an oxygenated fuel additive like methyl tertiary butyl ether (MTBE).

Today's electronic discharge-side foam proportioners represent a significant advance in hardware technology over the low-tech systems we have used in the past. This is an important development since the use of foam is playing an ever increasing role in today's fire operations worldwide.

Dominic Colletti is the Global Foam Systems Product Manager for Hale Products, Inc. and a fire instructor. Colletti is the author of *Class A Foam—Best Practice For Structure Firefighters* and co-author of *Foam Firefighting Operations 1* and *The Rural Firefighting Handbook* with Larry Davis. He also offers a *"Winning Strategies for the Successful Implementation of Compressed Air Foam Systems"* seminar.

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HALE PRODUCTS EUROPE AT INTERSCHUTZ

Hale Products Europe will be showcasing a number of innovative fire and rescue solutions at Interschutz 2005 in Hannover this June through the leading brand names of Hale and Godiva. Exciting new products will be on display in the vehicle mounted and portable pump categories as well as the latest developments in Foam Proportioning and Compressed Air Foam equipment.

Foam and CAFS

FoamLogix is the latest electronic foam proportioning system – this computer controlled system provides automatic prime, a foam agent induction range of 0.1 – 9.9% and a display of foam and water usage data all in a compact and cost-effective package. FoamLogix is the foam proportioning device for the Godiva World Series Pump with Integrated CAFS and also the MCP50 CAFS package. World Series CAFS systems are in service with a number of UK brigades, and Hale CAFS systems in general are very popular in Germany and throughout Europe.

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- The top of the range World Series WT6010 pump with gearbox, and two single pressure pumps – WS2010 and the powerful GV10000 will be available to view.
- Class1 Instrumentation – on display will be a World Series pump with Class1 pump data and control instruments – Intellitank gauges and SPS panels.

Also on display the World Series pump De-contamination adaptor – designed to provide warm water for de-contamination shower units.

Portable and Transportable models

- Latest version of the Powerflow 8/5 portable pump with the cooler, cleaner Briggs and Stratton engine and DIN exhaust connector. Both hand primer and exhaust gas primer models will be on display.
- The GP2300/15 is the latest version of the mid-range GP2300, diesel engined transportable pump. Powered by the Ford ZSG414 engine, this unit delivers 2400L/min at 7 bar from a 3m suction lift.
- Products from the American branch of the company will include the Qpak midship mounted vehicle pump, AP50 rear mounted pump and the latest version of the HP portable pump with a new Honda engine. The SMR-U is the stainless steel version of the Godiva World Series pump aimed at the North American market. Stainless steel provides a prolonged working life and guarantee against corrosion when using with seawater or contaminated water sources.

Also on display a selection of Typhoon positive pressure ventilation fans for effective control of smoke and fumes.

Sales and Technical staff from the UK and USA will be on hand to discuss any issues or questions visitors may have. The Hale stand is linked with its sister companies in the Idex Corporation – Lukas and Vetter, specialists in rescue equipment supply. An ideal opportunity to review a large proportion of your fire fighting needs. We look forward to meeting you on our stand (Hall 12, Stand C30).

For more information, please contact:
Hale Products Europe
Email: admin_haleuk@idexcorp.com
Website: www.haleeurope.com

CAPTURING REMOTE VIDEO FOOTAGE IN A FIRE SCENE? – NO PROBLEM!

Another exciting addition to the Argus®3 product range, the Remote Receiver Station is designed to allow the remote viewing of a thermal image from an Argus® camera, when fitted with the remote wireless telemetry option.

Gone are the days of portable monitors and trailing cables, the Argus®3 Remote Receiver Station is a compact carrying case comprising of a two-channel receiver with a built in 7-inch LCD colour screen and integral antenna.

The Remote Receiver Station requires a 12V dc power input, either via a standard camcorder battery (used already to power the Argus®3 thermal imaging camera), a mains power supply or an on-truck charging connector (as used on and currently supplied with the Argus®3 storage mount).

Additional functionality comes with the ability to record live video footage from an incident. Using a standard connection lead, the Remote Receiver Station can be connected to a remote video recorder (not supplied), to capture thermal footage directly from the fire scene.

For more information, please contact:
E2V Technologies
Email: argusdirect@e2v.com
Website: www.e2vtechnologies.com

NEW DECONTAMINATION SYSTEM FROM HUGHES

Hughes Decon Systems has delivered the first of its new lightweight, walk-through decontamination showers to the military and civil defence authorities in Belgium. They are compact, multi-purpose units designed for rapid response in the event of CBRN incidents and industrial chemical spillages.

"The Cupola Lightweight Mk1 is the latest addition to our range of decontamination systems," says Hughes Decon Sales Manager, Andy Whitehead. "Authorities now have even greater choice in sourcing the most cost-effective solution."

The unit is easily carried in its high visibility valise, which opens out to form a protective ground sheet under the unit. The base of the unit is permanently attached to the groundsheet, which provides protection against sharp objects when the unit is being positioned or when in use. Joints on the inflatable frame are glued and taped rather than welded as this has proved to be a more reliable method.

An air cylinder, which comes with the kit, provides a low pressure supply to inflates the four legs and create a frame to support the removable liner. An additional air inlet is also available so that the shelter can be inflated using an independent cylinder. A pressure relief valve prevents over inflation of the frame.

Showering takes place within the removable translucent liner, which is hung from the inflated frame using Velcro sleeves. Entrance and exit flaps in the liner can be sealed to contain the over spray during showering. The wash-off is collected in a sump in the base and can be pumped out through a waste connection in the liner.

Support personnel can monitor the decontamination process through windows on both sides of the unit and offer assistance by using the integral gloves fitted in the liner wall.

Seven nozzles at head and chest height ensure rapid and thorough showering. These can be supplemented using a hand-held wash brush fitted to a coiled hose. To ensure stability in adverse conditions, the unit can be secured to the ground using guy lines and pegs. The design is based on Hughes extensive experience in developing inflatable decontamination shelters and is intended to withstand repeated use in the most demanding conditions. Despite this, punctures can occur and to ensure the unit is returned to service as quickly as possible, a repair kit is included.

A Mk2 version of the unit is also available with two separate lanes to double the throughput.

For further information, please contact:
Hughes Safety Showers
Tel: +44 161 430 6618
Website: www.hughes-safety-showers.co.uk

DECON SHOWER CLASSIC UNDERGOES REDESIGN

Acknowledged as the mother of all portable inflatable decontamination showers **Professional Protections Systems'** DPI (decontamination portable inflatable) unit has undergone its first extensive redesign since its introduction in 1996 revolutionised the decontamination shower scene.

Since then derivatives of this PPS unit have become, amongst other things, the standard decon shower for the NHS, Hospital Trusts and ambulance services in the UK as well as the decontamination mainstay of emergency services throughout every continent. Highly effective, relatively low cost to purchase and operate, easy to transport and quick and easy to deploy, these are all factors that made the original DPI a classic.

They still apply to the redesigned DPI, but it is slightly larger. The inflatable supporting pillars and cross sections are also more robust giving the whole unit additional rigidity. The new DPI also incorporates raised flooring. Made from recycled plastics this keeps contaminant away from legs and feet. The new unit has also been designed to take practically all of the vast range of accessories that PPS offered to accompany the original model without any conversions being necessary. The idea is that customers switching from old style DPI to new style don't incur unnecessary extra costs.

According to PPS Managing Director Mark Whitcher the scope, quality and size of the accompanying accessory range is almost as important as the basic unit. "It's the accessory range", he says, "that enable us to customise every unit and the fact that we can produce something to the customer's precise specification is one of the main reasons for the continued success of the DPI concept, especially in overseas markets". Just how far this process has come since 1996 can be judged from the fact that whilst the original DPI had no accessories the most basic unit mow can easily have 17 or 18. This is the result says Whitcher not of commercial pressure but of emergency planning procedures being constantly rehearsed, reviewed and updated on both a micro and macro level.

For further information, please contact:
Professional Protection Systems
Email: sales@ppsgb.com
Website: www.ppsgb.com

XENON PRODUCT RANGE RETIREMENT

Service & Support Cease in July 2006

Vision Systems' commitment to provide Xenon product range End of Life (EOL) service and repair support will cease on 1 July 2006. This means that product replacements, repairs, refurbishment, support and spare parts will not be available after that date.

The intent to stop manufacturing of the Xenon range of smoke detectors was first announced in 1997. In June 1999, the sale of Xenon range of detectors including Xenon E700 (MKIII), E70D, Scanner and MiniVESDA, was officially discontinued.

Vision Systems would like to highlight to all customers and end-users with Xenon site installations, to strongly consider plans to phase out and replace these products with the new VESDA Laser-series range.

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- Flexible product range to ensure cost effective replacement of old technology
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For further information, please contact:
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Website: www.vesda.com/xenon

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Issue 13 - March 2005
APF
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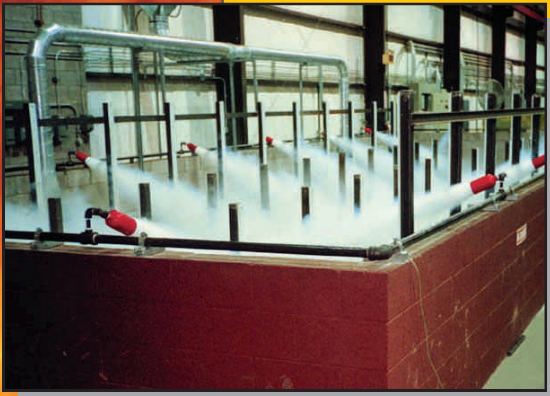

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Issue 14 – June 2005

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ASIA PACIFIC FIRE MAGAZINE

REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

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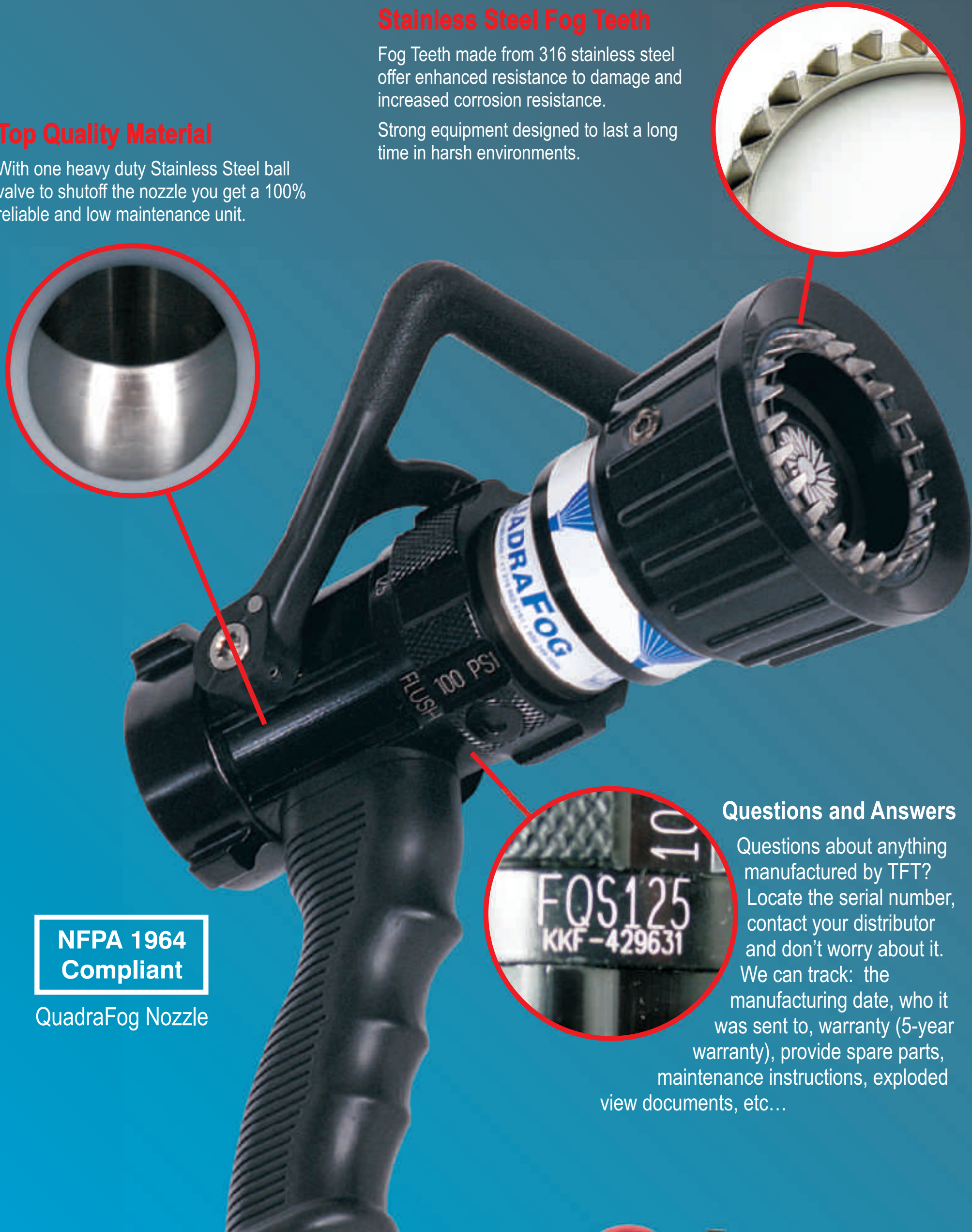

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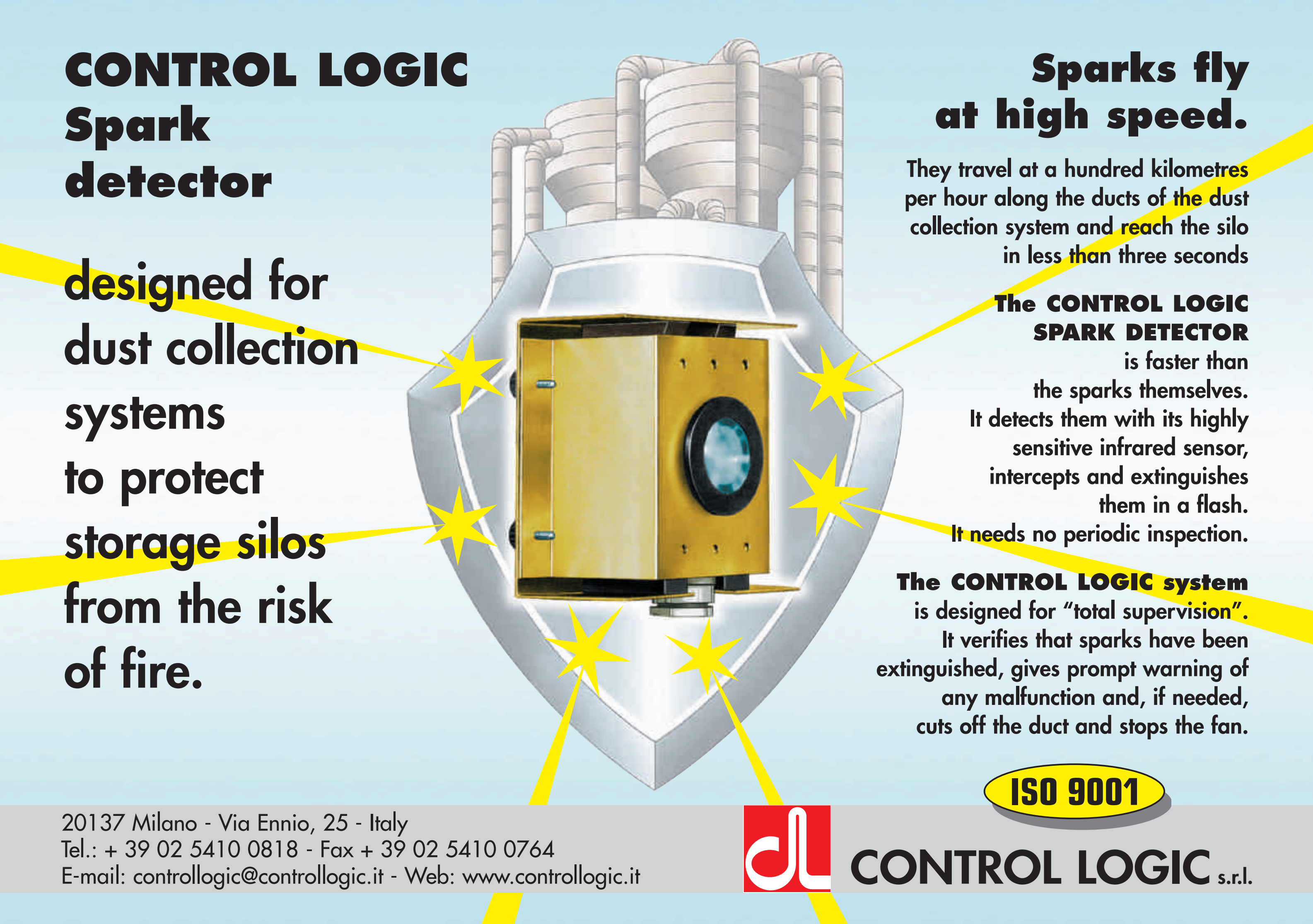

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FOREWORD

by Jeff Godfredson

NFPA's Asia-Pacific Operations Director

The Problem Continues . . .

Late last year the world had to confront the aftermath of a huge tragedy following the tsunami in south East Asia. At about the same time there were major fire incidents in South America, which took hundreds of lives.

Understandably the news coverage of the fatal fires was overshadowed by the scale of the events unfolding in Asia but for the individuals involved the pain and suffering was the same. Lives were lost, people were seriously injured and others lost their livelihood. The big difference is it is impossible to prevent a tsunami and very difficult to mitigate the outcome. Of course this is not true of a building fire.

There are many actions that can be taken by building owners/occupiers to try and prevent fires and there is much that can be done to minimize the effect of a fire should it start accidentally or deliberately.

Whilst I am not privy to the exact circumstances surrounding these latest fires I am sure that if staff were trained, fire extinguishing means were readily available (including sprinklers) and all exits were indicated and accessible we could have anticipated a less tragic result.

There is a tendency to view events in other countries as "their problem" rather than see them as a wake up call for your own community without the consequences. I would guarantee that in many of the communities served by this journal that there are buildings with all of the ingredients for an avoidable disaster just waiting to that small spark to create chaos. What will we do then? Wring our hands and ask how could such an event possibly occur and look for somebody to blame.

It just makes more sense to me to be proactive and deal with it before the event. I blame those who are not prepared to do anything in the face of this knowledge.

Jeff Godfredson
NFPA's Asia-Pacific Operations Director

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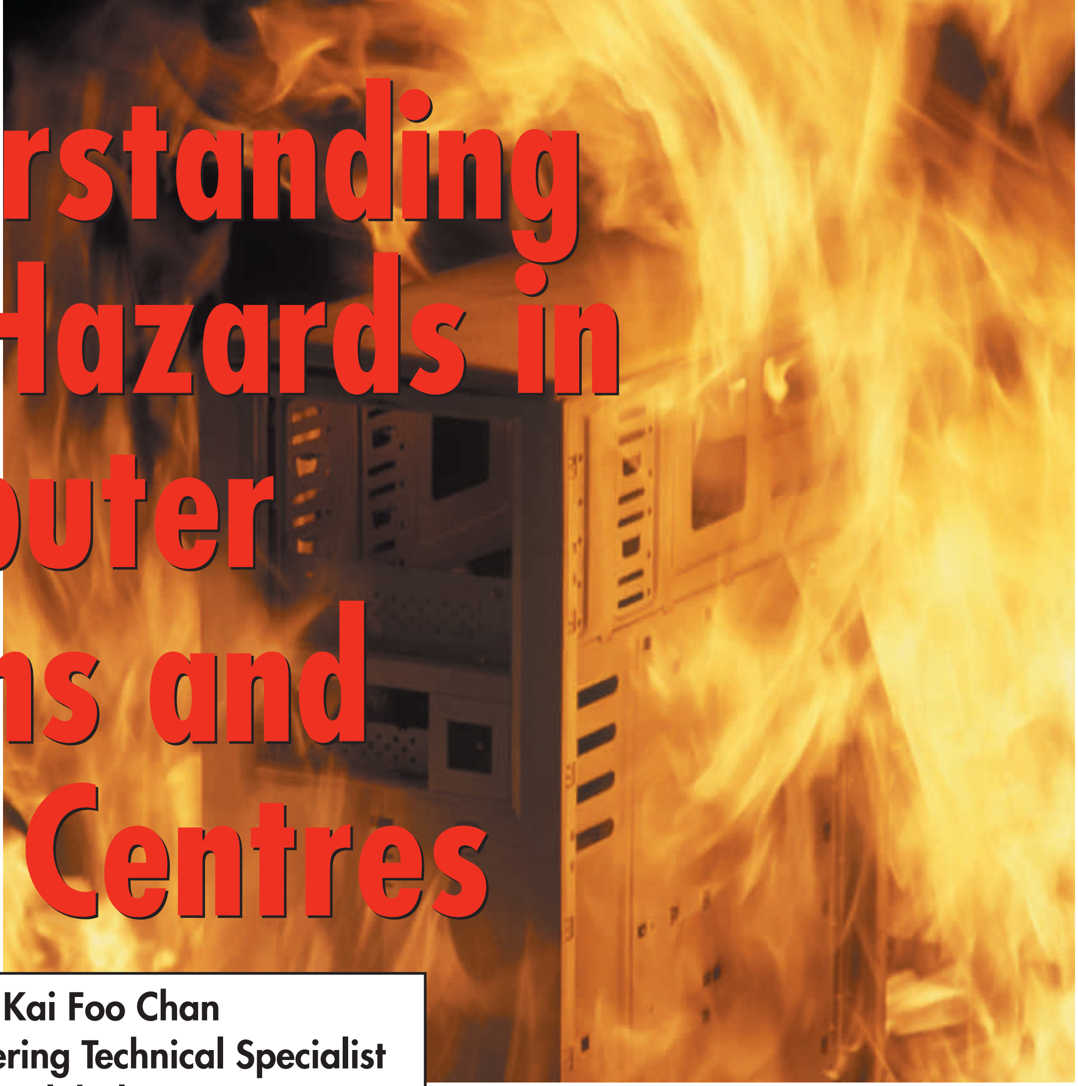
Understanding Fire Hazards in Computer Rooms and Data Centres



By Kai Foo Chan
Chief Engineering Technical Specialist
FM Global – Global Services, Asia

Picture courtesy of Firepix International

COMPUTER SYSTEMS ARE NOW the backbone of almost all industrial and commercial operations. The high values inherent in this complex equipment, combined with a company's dependence on computers for continuity of operations, make loss prevention a high priority. Almost without exception, companies cannot afford to lose the use of their computer systems for any length of time.

Based on the loss experience at locations insured by FM Global, there are various active and passive measures that can be taken to ensure adequate, cost-effective protection for electronic data processing (EDP) facilities. The focus here is on the protection of mainframe computer systems, high-value minicomputer systems and major industrial process control systems from fire and other major sources of loss.

The recommendations are based on the application of an overall risk analysis. It's a flexible approach that considers the values at risk (i.e., the total potential loss from physical damage and interruption of operations) then examines the traditional concerns of construction, occupancy, protection, and the human element. All of these factors have an interrelated effect on the possible effects of a fire or other incident.

FIRE HAZARDS

Fuel inside a computer area – this is one of the first areas to consider when looking at fire hazards. The aim is to reduce the amount of combustible material to a bare minimum. That involves using non-combustible housings for computer systems, reducing the amount of flammable media storage within the computer room – such as magnetic tapes and disks – or storing it in protective storage and minimising the use of combustible construction materials such as ductwork or insulation. Also, reducing the amount of flammable furnishings and stationery kept in the computer room is recommended. This will help reduce ignition sources and, if a fire does break out, reduce the fuel load available to that fire.

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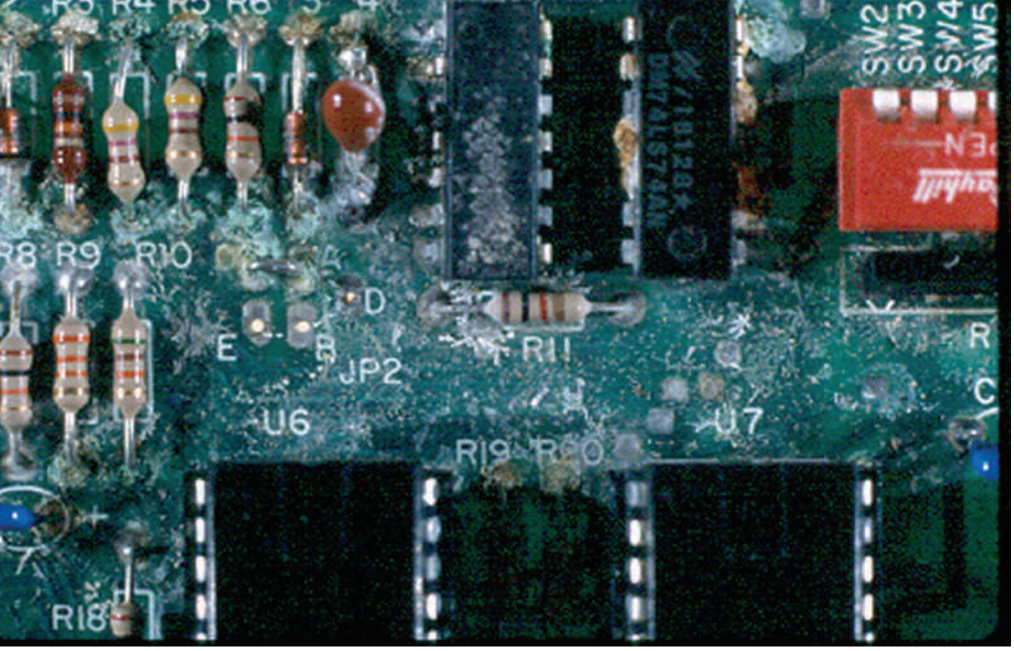
Fuel outside the computer area – Shielding computer operations from a fire outside the computer area is critical. In fact, loss history has shown that computer rooms have been damaged more often by fires originating outside the rooms than by fires originating within them. Computer equipment can be damaged from heat or smoke that travels from the original fire area.

The causes of fire – FM Global loss experience reveals that electricity accounts for the highest number of fires and the greatest financial loss. A



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computer facility includes a maze of power and signal wiring, and cables associated with both the equipment and building services. In addition, within the immediate surrounds of the computer area you will often find various other electrical equipment that may present a hazard. An ignition in that equipment could create an exposure fire. Even when the design and construction of a facility is to modern codes and standards, failures involving electrical components that lead to faults and ignition do still occur. Research has shown that enough heat may be generated by faults in low-voltage wiring, such as signal wires, to generate damaging concentrations of combustion products and ignition of adjacent combustible material.

Non-thermal fire damage – FM Global loss data has also revealed a less obvious side-effect of fire. Exposure of electronic equipment and wiring to even a small, smoldering fire may result in extensive non-thermal damage, i.e., damage caused by factors other than heat. The most significant agents of damage are the products of combustion, especially of burning plastics.

When many plastics burn – especially polyvinyl chloride (PVC), which is commonly used to insulate wiring – acidic vapors are given off. When these combine with moisture and oxygen, metal surfaces and electronic circuitry will corrode. In addition, particulate matter, such as soot, will coat components, causing them to fail.

Water allowed to dry on electronic circuitry leaves residue that is likely to cause malfunction if the equipment is operated (energized) without first wiping it clean. Water falling on energized circuits will cause short-circuiting and irreparable damage to those circuits that get wet. Another undesirable aspect of leaving equipment energized during a fire is that internal ventilating fans will continue to operate and spread contaminants further within the equipment.

On the other hand, magnetic tapes and disks exposed to products of combustion and water are usually not permanently damaged. Data is usually salvageable by prompt cleaning and drying.

USING AN OVERALL RISK ANALYSIS APPROACH

The choices facing risk managers and facility planners considering the adequate protection of their data processing operations are complex. Whereas, in the past, one would opt for either automatic sprinkler protection or a gaseous extinguishing system, regardless of the equipment or building construction and design, today's approach is one of overall risk analysis. This is an integrated approach considering all relevant site-specific factors, including the values at risk (how much equipment and how much of the building is expected to be damaged in a fire), construction, exposure from other areas or buildings, fire detection, smoke control, emergency response, equipment maintenance, and disaster recovery.

Duplication of records is a vital safeguard for data that is critical to the continuation of operations. Duplicate records may be stored at another properly protected location on your property or off premises. Alternative computer facilities may also be desirable for many operations. Such facilities may have compatible data processing systems in place; or they may simply provide a basic properly ventilated and wired building into which data processing equipment can be moved.

Once the risk analysis has been done, protection should consist of a combination of various safeguards, a discussion of which follows.

Construction – It is best to locate the computer center and associated media storage in a separate building of noncombustible construction, with adequate protection from any exposure from another nearby building, and adequate security measures to discourage unauthorized entry. If the computer room shares a building with other operations, it should be separated by a wall that has at least one-hour fire resistance and is smoke-tight.

Ventilation – Computer areas and records storage areas that share a building with other operations should have their own ventilation systems. Computer rooms should be at an air pressure slightly higher than adjacent areas in order to keep out damaging smoke and fumes. At existing locations, smoke detectors and smoke dampers should be arranged to keep smoke out of the computer room.

> *Research has shown that enough heat may be generated by faults in low-voltage wiring, such as signal wires, to generate damaging concentrations of combustion products and ignition of adjacent combustible material.*

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Power Supplies – Electrical power to computers and peripheral equipment should be designed with emergency shut off switches located next to the exit doors of the equipment room. Control, signal and power circuits should be installed in a manner to minimize the possibility of damage from fire, impact, abrasion, released liquids and other potential hazards. Backup power and emergency standby power should also be provided.

Occupancy – Occupancy conditions should not present a hazardous environment to computer systems. Preferably, keep paper supplies and records outside the rooms housing the computers and peripheral equipment. Also, limit the amount of furnishings in the computer room and ensure that any necessary furniture is non-combustible.

FIRE DETECTION

Smoke detection systems are a basic requirement for all computer and record storage areas. Where values are very high, high-sensitivity systems are recommended. Detection systems may serve multiple functions: activate alarms at an attended location; shut off the computers and peripheral equipment; activate a smoke removal system; and activate a fire suppression system (gaseous or sprinkler).

Detectors are spaced more closely in computer facilities than in other occupancies. One reason is that ventilation is normally quite strong in computer areas and tends to dilute the smoke quickly. Also, because of the damaging effects of even small quantities of products of combustion from burning or even heated plastics, it is important that the detectors sense the faintest trace of smoke in the earliest stages of generation.

FIRE PROTECTION

For the computer room – A total flooding gaseous extinguishing system is recommended for computer rooms where other fire damage mitigation, such as subdividing equipment into different rooms, or providing smoke control systems, cannot be used to prevent a potentially costly loss. In some cases, discharging the agent directly in the equipment's enclosure is desirable. As with any gaseous agent, room construction should be tight to prevent any agent leakage out of the room. A smoke-activated gaseous extinguishing system is preferred over a heat-activated automatic sprinkler system because the latter is slow to activate.

Automatic sprinkler protection is desirable for all computer rooms. Gaseous extinguishing agents protect the high-value electronic equipment from damage, whereas sprinklers are needed to extinguish fires in ordinary combustible material or combustible construction materials in a computer room. Computer system equipment should be de-energized by a smoke detection system before sprinklers operate to avoid electrical damage.

For cable spaces – Fire protection for noncombustible spaces containing grouped cables should be provided. In particular, where loss potential from a fire involving combustible cables is high, a gaseous extinguishing system is recommended. The extent of the hazard presented by grouped cables is best discussed with loss prevention consultants.

Manual protection – Portable extinguishers should be provided at clearly marked locations in computer rooms and related service areas. Select carbon dioxide extinguishers when purchasing new units. Water-type extinguishers will also be needed, as well as fire hose lines where there are quantities of ordinary combustible material.

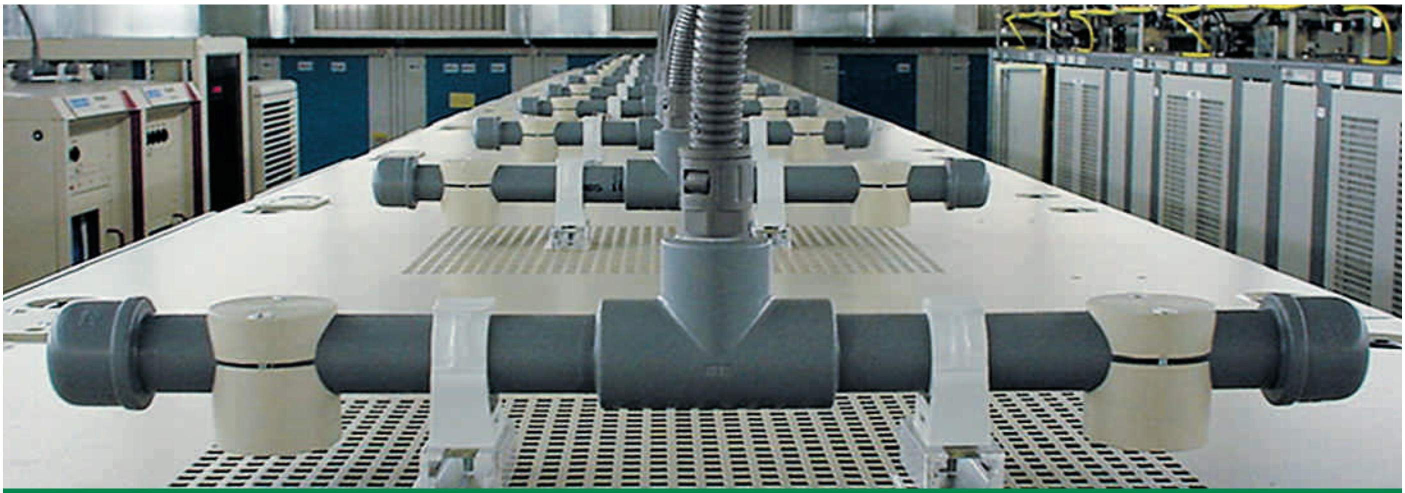
Human Element – Your emergency organization is a key component in the overall protection scheme. Personnel should be trained to take the correct steps without delay at times of emergency, such as shutting off power; using portable extinguishers on incipient fires; ensuring extinguishing and detection systems are operating; and notifying the fire department and designated facility personnel of the location and scale of the incident.

Having a salvage plan in place for immediately after an incident has occurred is also a very important concern. After a fire, employees should take appropriate action to minimize exposure of data processing systems to smoke and water. Cover equipment; remove portable equipment; install fans and dehumidifiers; and de-energize equipment. Where a gaseous extinguishing system is operating, personnel should be sure the protected area remains closed to confine the agent.

A disaster recovery plan is vital where computer operations are critical to an organization's survival. A major component of such a plan would be arrangements made with a restoration specialist who should be on the scene within hours to take appropriate damage-limiting action. Prompt cleaning and decontamination can restore equipment in a cost-effective manner and help return data processing equipment to normal operation.

Implementing Overall Risk Analysis

As the dependency on computer systems for business continuity grows, it's to your advantage to have a keen understanding of the particular risks that are specific to a computer room and the practical steps you can take to mitigate these risks. By taking these steps, you can significantly reduce the chances of a serious fire and the consequential costly interruption to your business operations.



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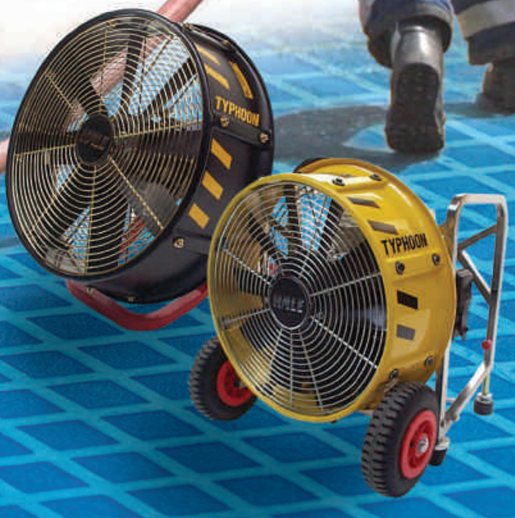
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Positive Pressure Ventilation in Firefighting

Picture courtesy of Russwurm

By Paul Grimwood

DESCRIBED AS THE 'wave of the future' in 1984; 'a giant step forward in firefighter safety'; and, 'the greatest innovation since the introduction of breathing apparatus', it is certain that Positive Pressure Ventilation (PPV) made a big impression upon firefighters in the 1980s.

A market review in 1999 demonstrated that 42 percent of UK fire brigades had purchased PPV blowers and research suggested that this figure was set to double by early 2001. Of the UK brigades already using PPV at that time, 27 percent were planning its use in an aggressive *pre-attack* mode. Some ten years previous a similar survey in the USA had suggested that up to 67 percent of users were utilising PPV in *pre-attack* situations providing firefighters with a more comfortable and safer working environment within a fire involved structure. This action also reportedly increased the chances of survival amongst occupants that remained trapped therein. The concept of 'blowing' air into a structure to remove smoke has been practiced for many years and the Scandinavians claim to have been the first to test the theory in the 1940s whilst in the 1950s, Fenno-Vent fans were used for such a purpose in Finland. Los Angeles firefighters similarly claim to have been utilising this tactical approach in structure fires since 1961 whilst in the 1950s it is reported that US firefighters used air blowers to control *backfiring* during west coast forest fires. In 1960 several large 72 inch air blowers were effectively used against the Rothschild refinery fire at Santa Fe Springs, California, projecting water-fog for over 300 feet through the convection column to cool and protect exposed tanks.

During the 1980s several fire departments and fan manufacturers in the USA advanced the concepts further still and the idea of a pre-attack application was developed. This approach (since termed *Positive Pressure Attack (PPA)*) was researched by the Fire & Rescue Services Division of the North Carolina Department of Insurance in 1988/9, focusing upon the use of PPV as a viable strategy in structural firefighting terms. The study addressed some highly relevant points, such as – Can PPV be used as an attack tool during fire suppressive efforts? Does PPV decrease the carbon monoxide levels inside the structure? Should PPV be used before water is applied to the fire?; Does PPV create a safer environment for firefighters and victims?; and, Does PPV improve visibility within a fire involved structure?. The tests took place in a two-storey purpose built masonry burn building specifically designed for 'live' fire training. The structure was set up to resemble a dwelling with two rooms on each level, totaling 119 sq.metres of floor space. Several fires were evaluated based upon three scenarios – (a) No PPV, (b) PPV prior to fire attack, (c) PPV used post-fire only. In each case, operations were effected two minutes after the temperature in the burn room reached 260 deg.C. Carbon monoxide (CO) levels within the structure were measured at six locations, including the ground floor room adjacent to the fire room (at 73.5 centimetres above floor level) and in an upstairs room serving as the furthest point from the burn area.

The test results showed –

- CO levels on the fire floor were increasing from the moment the fire originated and peaked at three minutes.
- CO levels on the floor above the fire did not register until almost two minutes after the fire had started. However, after four minutes the CO levels were higher at this location than on the fire floor.
- The ability of PPV to reduce CO levels throughout the structure was outstanding, particularly in areas furthest from the fire. During the decade following these tests there has been similar research carried out in many other countries including the UK, France, Sweden and Finland and the findings are jointly and conclusively in support of PPV's ability to rid fire involved structures of smoke and toxic/flammable products within an effectively reduced time frame.

Picture courtesy of Tempest Technology

GENERAL OPERATING PRINCIPLES

As it applies to firefighting operations, the term **tactical ventilation** is a strategy that *may be defined* as – 'an intervention by firefighters to open up a fire-involved building, releasing the products of combustion from within to gain tactical advantage during the overall approach to the firefighting and rescue operation'. It may also refer to tactics used to 'close-down' a structure (anti-ventilation) in an attempt to control the 'air-tracks' into/from the fire compartment. Such strategies should be employed with a specific purpose or intent and should not be randomly utilised. Any such action should also be pre-planned and clear guidelines should exist in the form of written Standard Operating Procedures (SOPs) forming a foundation for effective and safe ventilation practice. This pre-plan should take into account the following principles: any attempt to ventilate a fire-involved structure must be **co-coordinated** with interior attack and rescue teams. This requires an effective **communication** link between these crews and the fireground commander who is ultimately responsible for ventilation actions. Any openings in the structure must be made with **precision** to serve a specific purpose, ensuring they do not cause the fire to spread. An element of **anticipation** is necessary in preparation of likely outcomes and any required actions, e.g.; a charged hoseline should be laid in advance to cover openings made where exposures may be at risk.

BASIC PRINCIPLES

In its purest sense, the implementation of PPV entails the sitting of a 'fan' (also termed *smoke ejector* or *blower*), or multiple fans in various configurations, so that the airflow created by the fans is directed into the structure, creating a positive pressure therein. Important features of the techniques are – (a) fan capability (b) fan placements and configurations (c) discharge openings (size and location) (d) wind direction and effects (e) sequential ventilation.

WIND DIRECTION & EFFECTS

Early research in the USA suggested that wind speeds of 25 mph (40 kph) could be overcome by opposing PPV airflows where necessary. However, more recent research in the UK might suggest that opposing head wind speeds as low as 6 mph (10 kph) may serve to counter the effects of PPV and create a situation where it is difficult to overcome the natural airflow. In this case, *exhaust points* should be smaller than *air inlet points* (i.e.; 2-1 inlet to outlet ratio) to assist the PPV airflow to gain momentum (velocity) against any head wind. Similarly, cross-winds may affect the stability of PPV airstreams causing the outputs of fans to be disrupted. It is worthy of note that the high velocity airflows associated with *turbo style fans* are far less likely to be affected by adverse wind effects. The research also suggests that tail winds in excess of 12.3 mph (20 kph) may not be assisted further in their natural ventilation capability when supported by conventional airflows from PPV blowers. Therefore, the wind strength and direction should be noted and taken into consideration whenever PPV is utilised on the fireground.

SEQUENTIAL VENTILATION

Where contaminated areas requiring ventilation form definite compartments within a structure, the process of *sequential ventilation* will achieve the best results. This entails providing the maximum amount of pressurised air from a blower to ventilate each area in turn. Such an effect is obtained by opening and closing doors within, to direct the inflow of air towards designated channels.

PPV – EXTREMELY VERSATILE

The techniques associated with PPV have become extremely versatile and are not restricted to clearing compartments of smoke. In addition to the applications already discussed PPV may be used to:

1. Reduce levels of carbon monoxide, and other toxic and irritant gases, during the 'overhaul' (mop-up) phase of fireground operations.
2. Create pressurised stairways or clear smoke in high-rise buildings to assist firefighting efforts or persons escaping from the structure.
3. Clear the structure's facade of smoke to assist exterior rescue operations and enable the incident commander to make a reliable assessment of the situation.
4. To divert smoke away from firefighters during firefighting in the open – car fires etc.
5. Control and abate certain airborne contaminants such as anhydrous ammonia.
6. Confining the spread of fire in 'defensive' applications, for example, in 'strip' shopping malls.
7. Controlling and assisting the extinguishment of chimney fires.
8. Larger PPV units are available to control and ease firefighting efforts in tunnel fires.

REDUCING THE HAZARDS ASSOCIATED WITH AFTER-FIRE 'OVERHAUL' (MOP-UP) OPERATIONS

Deborah Wallace detailed a large number of cases in her book *In the Mouth of the Dragon* (Avery Publishing NY.USA) and developed upon the notion that modern plastics play a far bigger part in causing fire deaths than is currently realised. A close analysis of fires also suggested that short-term exposures to fire gases resulted in long term effects for survivors. It is commonplace for plastics to decompose in fires, discharging amounts of toxic gases, corrosive irritants, asphyxiants and organic chemicals into the atmosphere. Those that are subjected to even small amounts of such emissions may suffer damage to internal organs such as the heart, brain, kidney and the liver, as well as amounts of respiratory tissue death, lung edema and haemorrhage, chemical pneumonia and bronchitis, susceptibility to respiratory infections, permanent abnormal lung functions, skin scarring and sensitisation, eye damage, and neurological and vascular reactions. Organic chemicals usually affect the nervous system – Phthalates are heart poisons – Benzene causes blood cell abnormalities including leukemia, and many organics poison the liver and may cause cancer . . . the list is endless! What is perhaps more relevant is the fact that many of these contaminants are still present in danger-

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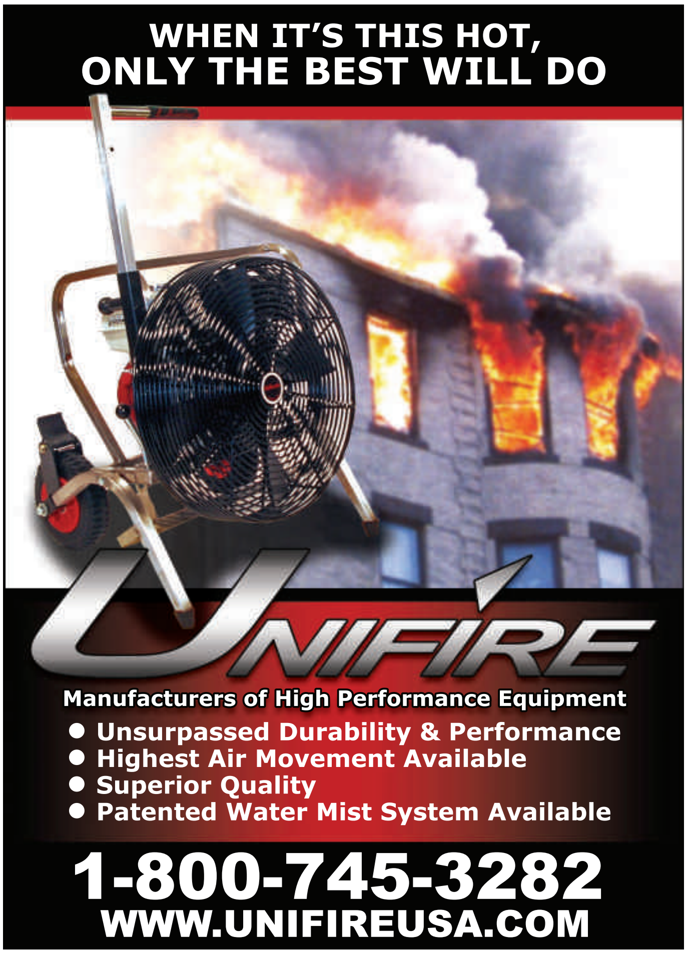

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Picture courtesy of Supervac

ous amounts even *after* the fire has been extinguished and firefighters are often standing and working in what appear to be 'clear' zones without the protection of breathing apparatus! It is commonplace for firefighters to experience sore throats, tight chests with some pain, headaches, nausea, irritated eyes and lung congestion following heavy 'mop-up' operations at fires – it is part of the job – but is it necessary?! Studies have suggested that in certain cases there may be longer-term effects – even cancer and heart disease.

The potential for PPV to clear stagnating fire gases and contaminants from a compartment during the 'mop-up' phase is a well established and used technique and environmental monitoring is utilised to record the reduction in air pollution. Some fire departments in the USA have established a policy of removing breathing apparatus for interior 'mop-up' at recorded levels of 35 ppm CO or below. In contrast, the Ottawa Fire Service in Canada has established 5 ppm as the safe limit.

The use of PPV during 'mop-up' also serves to assist firefighters by showing up hidden embers and areas that remain smoldering. It is suggested that such operations are augmented by thermal image cameras to locate hotspots safely and effectively.

PPV AND THE HIGH-RISE FIRE SITUATION

The famous fire at the MGM Grand Hotel in Las Vegas clearly demonstrated that the movement of smoke and toxic gases throughout a high-rise building may often present a greater hazard to life and firefighting efforts than the spread of fire itself. The problems associated with venting smoke from tall buildings are unique and special attention should be paid to the techniques utilised to achieve such objectives.

A symposium held in North Carolina, USA brought together PPV specialists from all over the USA to present views and share experiences. The symposium

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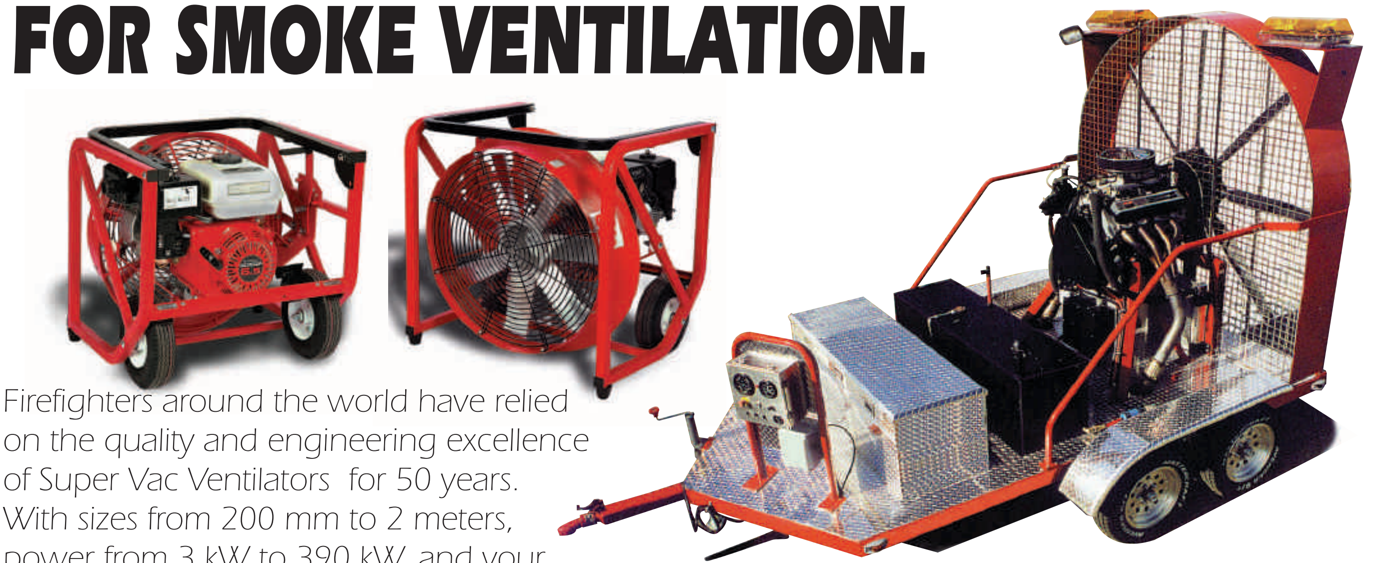

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included live demonstrations of the effectiveness of PPV in a 32-storey office tower under construction. The demonstrations utilised a ground level corridor, the emergency stairwell and two floors (levels 20 and 28). By using a rooftop discharge opening it took natural air movements (stack action) 15 minutes to clear the 30-metre long ground floor corridor of smoke whilst two PPV blowers (placed in-line) were able to achieve the same in just seven minutes. Further tests by the Charlotte Fire department involved smoke-logging upper floor areas of 644 sq.metres and 1,288 sq.metres respectively. Various fan placements were evaluated to compare their effectiveness, including in-line and parallel configurations forcing air into the base of the emergency stairwell. During the course of one operation a fan was sited at an upper level to boost the airflow. This arrangement led to a noticeable build-up of exhaust fumes on the involved floor although CO monitoring equipment was unable to detect any measurable amount. The various fan placements all effected adequate smoke clearance times, forcing smoke to leave the involved floors at an average rate of 46 sq.metres per minute.

When smoke enters a stair shaft in a tall building it will generally rise to the upper levels and either *mushroom* at the top of the shaft, where it is unable to escape from the structure, or *stratify* at a mid-point within the shaft where the smoke has cooled. This straification generally serves as a 'lid' for other products of combustion, which tend to bank down below the stratified layers. The principles of PPV may be harnessed in several ways to assist firefighters in the high-rise situation. Upper levels may be cross ventilated by various configurations of blowers sited at ground level. Tests have shown this set-up to be effective generally up to 25 storeys. Above this level additional fans will normally be needed to boost the airflow on the involved floors. Vertical ventilation may also be effected within a stairshaft by multiple fans configured at ground level. Where the intention is to prevent contaminants from entering the stairshaft (pressurisation) the operation will prove most effective with no openings at the top. However, where the objective is to clear a smoke logged shaft, the head of the stairs will require an opening to exhaust the contaminants to the exterior. Many high-rise buildings already have pressurised stairshafts built-in to maintain smoke free escape routes. The same principles that apply to the overall effectiveness of these systems also apply to PPV operations in tall structures. The potential for success is dependant on restricting leakage paths from the area to be pressurised.

Past experience has demonstrated just how difficult it is to keep stairshafts free of smoke where pressurised ventilation does not exist. As firefighters gain access to the fire floors and 'lay-in' hoselines from rising main systems lobby doors are often forced to remain open, allowing smoke to contaminate the shaft. This creates difficulties for firefighters working on upper floors and is particularly a hazard where occupants remain trapped above the fire floor/s. The Los Angeles Fire Department experienced such problems during the massive fire at the Interstate Bank in 1988 and have since written the use of PPV under such circumstances into their standard operating procedures covering high-rise firefighting. A recent FEU scientific (UK) report (11/97) suggested that it may be more productive to open windows from the fire floor upwards while ascending

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than by opening the highest vent only where the aim was to clear a stairshaft of smoke. However, it should also be noted that air-conditioned high-rise stairshafts rarely have naturally opening windows and any such ventilation openings would need to be created through breakage.

THE USE OF PPV TO CLEAR SMOKE FROM A STRUCTURE'S FACADE

On occasions, the responding fire force is faced with large amounts of dark smoke issuing from openings on the structural facade as they arrive on scene. The true extent of the situation as it is evolving may be masked by the quantity of smoke as trapped occupants cling to ledges several floors above ground. Overhead power and telephone lines, street lighting and projections from the structure may not be immediately apparent to firefighters and the entire situation may be hindering prompt ladder placements enabling rescuers to reach those in immediate peril. The use of PPV to create a false wind across the face of a structure may, if used in this way, clear smoke from the facade and allow lighting to facilitate priority ladder placements and assist the incident commander in making a reliable and accurate assessment of the situation.

PPV IN A DEFENSIVE MODE

The use of PPV fans to confine a fire has become an established defensive strategy whereby compartments surrounding or aside of the fire compartment itself are pressurised with airflows to prevent fire and contaminants from spreading beyond the compartment of origin.

PPV AND CHIMNEY FIRES

Several fire authorities in the USA have developed techniques to assist firefighters in extinguishing chimney fires that avoids the need for firefighters to operate from rooftops during inclement weather conditions. These techniques entail using a PPV fan run at ½ to full RPM in unison with a dry chemical extinguisher discharged up into the chimney shaft in 1-2 second bursts. A thermal image camera should be used to assess the situation and prevent any fire extension into walls, flooring or roof voids.

PRE-ATTACK PPV – OPERATING PRINCIPLES

The basic principles for initiating and using PPV have already been discussed and when used in the pre-attack mode the operating principles remain the same, with one or two minor adjustments. Much emphasis should be placed upon promoting a general awareness of potential shortfalls where incorrect applications may be made.

- A pre-written document should exist providing guidelines on application technique in each fire authority area choosing to adopt the strategy of PPV.
- Always create an exhaust point for smoke and gases before directing the PPV airstream into the structure.
- Where fans are correctly sited (not too close to the entry point) any churning effects of the smoke and gases should be avoided and disruption of the thermal layers kept to a minimum.
- The application of PPV will most likely cause a compartment fire to burn with greater intensity. There may even be an initial rise in compartmental temperatures. However, heat flux is most likely to reduce within the first few seconds of application as cooler air enters the compartment.
- Where PPV is used to ventilate T shaped compartments from the base of the T a 'swirling' effect in the smoke patterns has been noted that reduces the effect of gases leaving the compartment efficiently.
- As smoke gases and flames depart at the exhaust point there is a danger that local exposures may become involved with fire. This hazard should be anticipated and covered with hoselines sited defensively.
- Where a fan is sited too close to the point of air entry and/or the exhaust point is unable to function to full capacity a 'blowback' of flame/gases may appear at the entry point. Try either moving the fan back; improving the exhaust action – or turn the fan off.
- The immediate siting and operation of a PPV fan prior to the entry point being effected may serve to disguise any indication of backdraft conditions where smoke might normally pulse back and forth under normal air entry conditions as opened.
- Any attempt to move smouldering mattresses or chairs while PPV is in operation may lead to an amount of 'flame-up'. It is essential not to get caught without some extinguishing medium on hand when doing so!
- Before initiating pre-attack PPV -
  (a) Know where the fire is located.
  (b) Lay hoselines in readiness.
  (c Ensure the fan is ready.
  (d) Create an exhaust point (near area of involvement).
- Pre attack PPV should NOT be initiated where –
  (a) Signs & Symptoms of backdraft are apparent.
  (b) Where dusts or powders may be disturbed.
  (c) Where the fire's location has not been established.
  (d) Points of fire exposure are not covered by protective hoselines.
  (e) Where the fire is known to be spreading beyond the compartment of origin.
  (f) When it is recognised that internal layout is not suited to optimum airflows.

CONCLUSION

With 90 percent of structure fires being held to the room of origin there is much potential for the concept of pre-attack PPV to flourish. However, the use of PPV is not solely restricted to pre-fire-attack situations and the ever increasing scope of operations that may be effected by such a strategy makes PPV a most versatile and effective technique in modern firefighting terms.

Throughout the 1980s London firefighter Paul Grimwood presented several controversial papers and articles, based mainly upon his own operational research and experiences as a firefighter both in the UK and the USA, that closely examined structural ventilation practices as carried out by firefighters around the world. His proposed concept of 'Tactical Ventilation' – was to encourage an increased awareness of 'Tac-Vent' Ops and PPV and present a safer and more effective tactical process for the ventilation of fire-involved structures by on-scene firefighters, paying particular attention to the influences of air dynamics and fire gas formations. Following work with Warrington Fire Research Consultants (FRDG 6/94) his terminology and concepts were adopted officially by the UK fire service and are now referred to throughout revised Home Office training manuals (1996-97).

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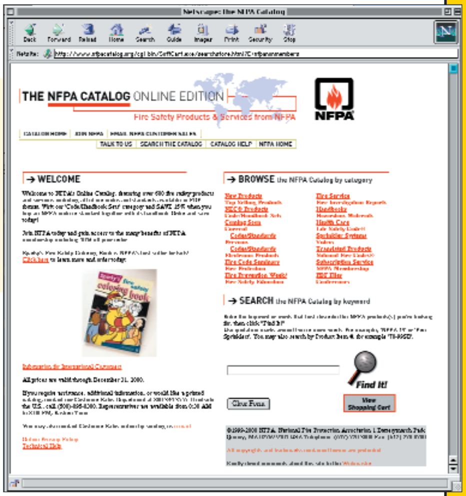

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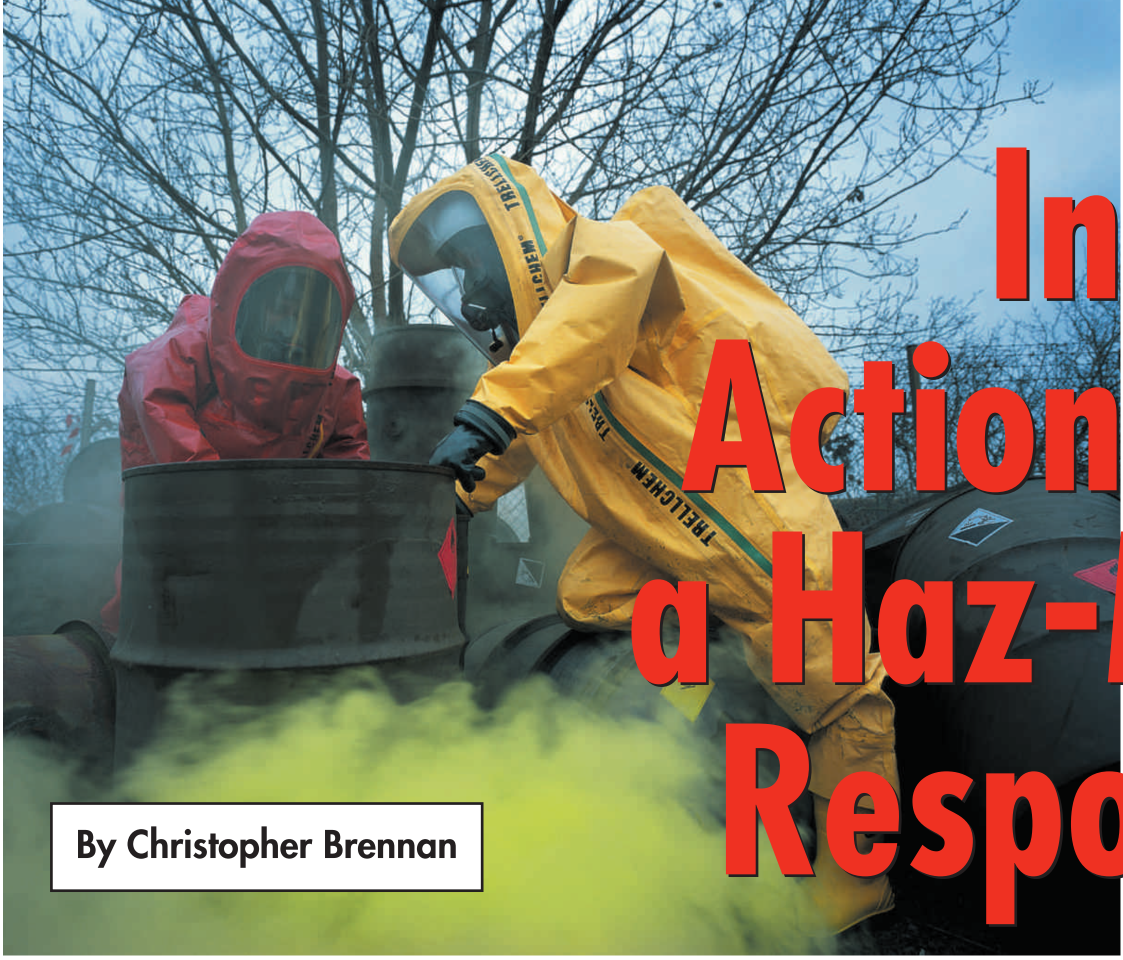
Initial Actions at a Haz-Mat Response

By Christopher Brennan



Picture courtesy of Trelleborg Protective Products

DURING THE PAST FEW YEARS, the fire service has spent a lot of time discussing weapons of mass destruction and developing a basic understanding of terrorism. This was an important step for our nation's first responders to take and for our fire departments to invest time in. But remember that training for terrorism is in many ways like training for trench rescue: The training is necessary, but it is very unlikely that most responders will actually confront such an incident.

The result of this focus on acts of terror is that we have, in certain cases, allowed our core hazardous-materials response competencies to fall by the wayside among our frontline companies. Plain old Haz-Mat accidents continue to happen every day and will continue to happen. We need to get back to the basics in Haz-Mat, just as we did with firefighting after the initial rush of technical rescue several years ago. We need to think about leaking MC-306/DOT-406 cargo tank trucks and one-ton chlorine cylinders again and set the attack with nerve agents on the back burner as we brush up on the basics. This back-to-basics program will be most helpful for engine and truck company officers and firefighters.

First-due fire companies will initially recognize many Haz-Mat incidents. Your engine crew may be dispatched for the "odour investigation," for example, and arrive at a construction site to find a drum leaking an unknown substance. Your truck crew may be assigned to investigate an "unknown alarm" going off, called in by a cell phone caller, of course, and find that it is a chlorine alarm at a local pool. It is the first-due company that will initiate the Haz-Mat Response Team's (HMRT) action and set the stage for the incident.

Members who aren't certified Haz-Mat technicians sometimes feel that there is little they can do between calling for the response team and that team's arrival. That is far from true. Taking small but crucial steps in the first minutes will dramatically improve the course of the entire incident. What, then, can our first-due responders, our awareness- and operations-trained personnel, do to make this situation better without exceeding the scope of their training? They can keep themselves and the local civilian population out of the hazardous area and establish the incident management system (IMS).

From the dispatch of the first company, the incident management process begins. There are several variations on the IMS, and each department should select its own system. The IMS must be outlined in department policies and procedures; the department's standard operating guidelines (SOGs) should address the scope of implementing the system. The Illinois Fire Service Institute's (IFSI) five-step incident management process is particularly useful. In this model responders are taught to do the following:

1. Isolate an incident.
2. Identify the product and hazards.
3. Notify needed resources and required agencies.
4. Mitigate the hazard.
5. Terminate the incident.

The isolating, identifying, and notifying tasks may not necessarily be performed in that order; steps are taken as needed according to the incident's severity and the incident commander's

Initial Actions at a Haz-Mat Response

priorities. Specific tasks may be accomplished early in an incident and later revisited or revised as the scene changes. We will discuss later specific tasks that the first-due company can perform within the scope of its training, which should be at a minimum the operations level. This will set the stage for a successful incident conclusion using the five-step incident management process.

Note that the HMRT will most likely revisit all of these steps on arrival and may change the operational concept the first-due companies have implemented. These changes will be based on more detailed science and research, monitoring, and the effects of the actions initially taken by the first-arriving companies.

ISOLATION

The first-arriving company will determine how best to isolate the incident in the early stages. Ideally, any incident that sounds like it may potentially involve a Haz-Mat release will prompt the company officer to request wind direction and speed from the fire alarm office and to instruct the apparatus driver/operator to approach from an uphill and upwind direction. Additionally, the apparatus should be backed down to the incident, if possible, to allow for a quick retreat if there is a sudden change in conditions, or if the incident is determined to be larger than initially believed. These actions will have the greatest positive effect on member safety in the early stages and should be the primary concern of the first-in officer.

IDENTIFICATION

On arrival at the scene, the company should use tools such as binoculars and the North American Emergency Response Guidebook (ERG) to identify the product or products involved. Also, the company should request the assistance of anyone responsible for the product in obtaining material safety data sheets (MSDSs), shipping papers, or other information that will assist in determining the severity of the incident. The first-responding fire company should attempt to gather knowledgeable people and keep them available for the Haz-Mat response team. The HMRT would likely interview these people to determine the cause of the leak or spill and what the hazards of the product are. These actions fall under the "Identify" stage of the incident management process but must be accomplished before the isolation zone can be more clearly defined.

Once container shape and size, placards, labels, or shipping documents have generally identified the product, the initial hot zone can be modified as needed. This area should be large enough to ensure that all companies upwind and downwind are in a safe atmosphere and also allow for any product movement as a result of environmental conditions or even a catastrophic failure of the product's container. The ERG provides a good deal of help in establishing initial isolation zones and should be consulted early. Actions such as setting hot zones are important defensive operations and require companies to trade space for the safety of responders until the HMRT arrives.

NOTIFICATION

The process of notifications should begin at the same time that the initial isolation and the identification of the product are occurring. It is imperative that the company officer requests the HMRT as soon as there is reasonable suspicion that you are dealing with a known or potential Haz-Mat release. You then can continue to relay information as you develop it to the team while they are en route. In addition to the HMRT, the fire alarm office will have to be notified of the resources needed (e.g., police for isolation or evacuation, additional alarms if the incident involves serious fire or the threat of a fire, and EMS resources to treat any injuries). In the notification process, having a phone

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Initial Actions at a Haz-Mat Response

line available to relay information is a very helpful tool. The process of reading and spelling out the name of a product over the radio is time-consuming, preventing other radio traffic from getting out; it is prone to error because of traffic being stepped on by other units; it may reveal to the general population, using scanners, more information than you would be ready to release. In this age of inexpensive cell phones with walkie-talkie features, the addition of a phone capability will potentially save many headaches and create an environment where operational security can be more easily maintained.

Cell phones won't prevent a dedicated or devious individual from obtaining information about your operation. However, they can prevent the general population and the media from obtaining information you are not prepared to release.

MITIGATION

The first step in mitigation is establishing emergency decontamination. In the beginning of an incident, emergency decontamination can be established using a 1¾-inch hoseline with a fog nozzle and some means of containing runoff. The containment system can be as simple as flushing contamination off an individual over a grassy area that can later be excavated by a cleanup contractor if needed. Of course, this system of emergency decontamination is the bare minimum that should be established. It is not sufficient for teams conducting reconnaissance or entry; it is established to handle a true emergency only. Members assigned to operate the emergency decontamination sector should be in full turnout gear, with SCBA and hoods in place. As soon as is practical, a more formal emergency decontamination system should be implemented with a true containment system and staffed by responders in chemical protective clothing.

Beyond establishing emergency decontamination, the company officer must use SOGs and assess available resources to determine if any other mitigation steps can be accomplished. For example, shutting down a valve remote from a leak is a mitigation step that can be accomplished from a defensive posture, but only if the company officer has such discretion to act according to the department SOGs and after consultation with knowledgeable facility representatives who can determine if such action will increase the overall problem by impacting other processes.

> *Beyond establishing emergency decontamination, the company officer must use SOGs and assess available resources to determine if any other mitigation steps can be accomplished.*

TERMINATION

Termination is the final step in the five-step IMS. The first-in companies will not engage in terminating an incident if they have called for a HMRT or extra alarm companies. The responsibility for terminating the incident will fall on the incident commander. The first-due company, however, can obtain information such as names, addresses, and phone numbers of responsible parties, shippers, and any witnesses that can be handed over to the incident commander to help terminate the incident. After the incident is handed over to a remediation contractor, the first-responding companies should participate in the post-incident debriefing and later critiques.

CONCLUSION

The engine and truck companies are the backbone of the fire service and must be prepared to respond to Haz-Mat incidents. Commonsense tells us that these first responders, along with local law enforcement in many cases, will be responsible for recognizing that a hazardous condition exists and starting the process of protecting the population and environment from the effects of the hazard. They must be trained and have the appropriate equipment and personnel to bring a Haz-Mat incident under control by isolating the scene, identifying the product, and notifying the appropriate resources needed to mitigate the incident. The specific circumstances of isolating and identifying materials described in this article should not be considered the only options; there are many ways of accomplishing these tasks, and companies will become proficient in them only through training.

> It is imperative that fire companies are trained to understand the scope of the actions they can be expected to handle and given the equipment to accomplish those tasks. Proper training, equipment, and personnel are needed to operate safely and effectively."

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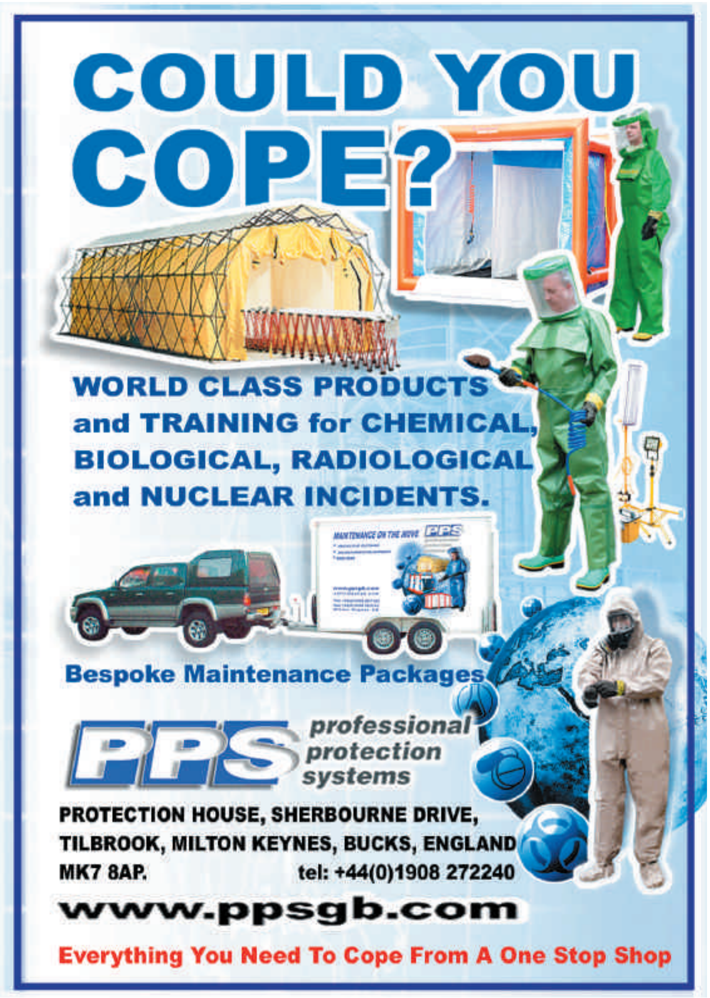
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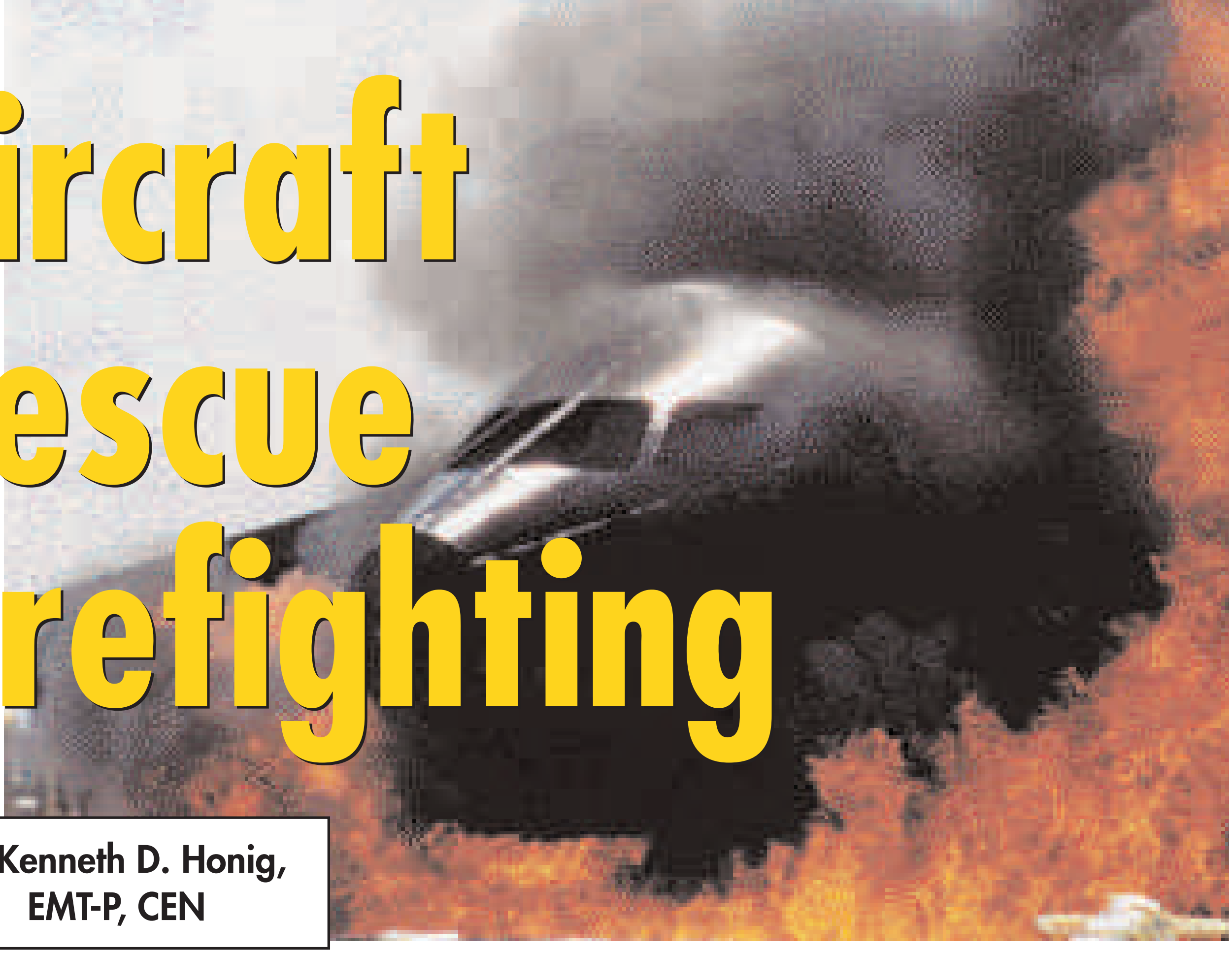

Aircraft Rescue Firefighting

By Kenneth D. Honig, EMT-P, CEN

THE CRASH OF A commercial jetliner raises the specter of such overwhelming death and destruction that most people would rather not consider the possibility. Unless a community is in close proximity to an airport, it is often difficult to get the commitment of resources to plan for such an event. However, it is the responsibility of emergency managers to plan for the unthinkable. For those individuals who insist that these types of incidents only occur "someplace else," remember that to emergency managers in other municipalities, your community is somewhere else.

In this series of articles, we will consider the role of fire, law enforcement and EMS agencies when responding to an off-airport aircraft crash. In this issue, we begin by reviewing aircraft rescue firefighting.

AIRCRAFT RESCUE FIREFIGHTING

Aircraft rescue firefighting (ARFF) encompasses the techniques, tactics and skills utilized to maximize the number of survivors of an aircraft crash. This involves the use of specialized and sophisticated equipment, and the implementation of specific strategies and tactics, with priority being placed on rescuing the greatest number of victims in the shortest period of time.

In order to certify them as airworthy, manufacturers of commercial jetliners must demonstrate that their aircrafts can be evacuated of their full capacity in under three minutes, utilizing only half the available exits.[1,2] However, a jet aircraft can still be compared to a crowded movie theater with too few exits to pass any building code in the country.

Due to the nature of the combustibles involved in an aircraft crash, the physical forces which are experienced and the potentially large number of victims, strategic priorities differ from other types of firefighting scenarios. In ARFF, the emphasis is more heavily weighted toward rescue than in structural firefighting. With a potential 300+ victims, many of whom will have suffered burns and/or traumatic injuries and are in need of extrication, all available resources must concentrate on the rescue effort. This often involves the tactical decision to ignore a large body of fire until after rescue of the passengers and crew is accomplished.

The rule of thumb is initially to fight only the fire that interferes with the rescue. Once the rescue is completed, resources can then be redirected to firefighting. This is in contrast to a structural fire response, where saving the bedrooms from a kitchen fire is considered a win. After all, you can't save half an airplane!

ARFF TECHNIQUES

Techniques initially employed in the response are geared toward extending the "escape window" to allow the evacuation of passengers and crew.

Aviation fuels burn at extremely high temperatures, between 3,000°F-4,000°F. The environment inside an aircraft cabin can reach uninhabitable temperatures within two minutes. By employing the "area concept" technique of blanketing the outside of the fuselage with overlapping streams of firefighting product to draw off heat, escape time for passengers can increase significantly.

Tests conducted at the Federal Aviation Administration's (FAA) research facility at Atlantic City Airport in New Jersey demonstrate that a fuel fire inside an aircraft cabin can reach temperatures that lead to flash-over conditions in less than four minutes. The immediate application of massive quantities of cooling firefighting product to draw off this heat is the most effective technique for increasing survivability in a low-impact aircraft crash fire incident.

When planning a fire attack, certain basic principles should be employed.

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The responding firefighting force should make the initial attack from upwind of the fire. This allows nature to reduce the amount of heat and smoke these firefighters will encounter. Remember that structural firefighting protective clothing provides inadequate protection against extreme temperatures generated by burning aviation fuels. When approaching the scene, firefighters should realize that due to their limited initial firefighting capacity, they should not waste time or product extinguishing fires that do not involve passenger areas. Burning wings, engines and landing gear do not normally contain passengers, and unless the fire is encroaching on passenger or other inhabited areas, it should be ignored until passenger rescue is complete.

The first priority is to create and maintain a rescue/escape path for passengers evacuating the aircraft. Secondly, product should be applied to cool the areas of fuselage where radiant heat from a fire has begun to encroach. Finally, after the passengers' safety is established, and if sufficient quantities of firefighting product are available, mop up of other areas can begin.

PREPARATION CONSIDERATIONS

In order to prepare for an aircraft emergency, agencies should become familiar with how airports deal with on-site incidents.

The FAA has promulgated Federal Aviation Regulations (FARs) on a variety of subjects involving operations of aircraft and airports. FAR Part 139 [14CFR Part 139] deals with, among other things, aircraft rescue and firefighting. Part 139 details the required areas of training for aircraft rescue firefighters, and specifies the type and capacity of equipment available to respond to such incidents.

Aircraft rescue firefighting vehicles can be categorized into four types: rapid intervention vehicles (RIV); large capacity foam vehicles; tankers; and miscellaneous ancillary vehicles.

Rapid intervention vehicles quickly deliver a sufficient quantity of firefighting product to extinguish a small aircraft fuel fire or knock down a large fuel fire. Personnel on this equipment will also make the first evaluation of the incident and begin rescue operations. These vehicles carry 100-1,000 gallons of water and aqueous film-forming foam (AFFF), as well as a secondary extinguishing agent (Halon, carbon dioxide or dry chemical powder). To meet FAA mandated standards, this vehicle must be able to reach the midpoint of the furthest runway from the fire station and begin firefighting operations in three minutes or less from the initial alarm.

Large capacity foam vehicles carry up to 6,000 gallons of water and AFFF. They discharge firefighting foam through turrets at up to 1,200 gallons per minute or more, as well as through hand lines and under truck nozzles. They must be able to arrive at a scene within four minutes after an alarm is sounded.

Tanker vehicles may be utilized to transport large quantities of water or foam concentrate to the scene for replenishment of ARFF vehicles.

Other vehicles in an ARFF fleet may include command and communications vehicles, stair trucks, ambulances, MCI equipment carriers, hazardous materials/decontamination units, ladder and hose trucks.

The FAA makes yearly surprise tests of response time, equipment and training records. Failure to meet mandated standards can result in hefty fines and/or loss of certification.

FIREFIGHTING PRODUCTS

Class B firefighting foams are the primary agent used for fighting aircraft fires. Foam is defined in NFPA Standard-11 as "a stable aggregation of small bubbles of lower density than oil or water, and shows tenacious qualities for covering horizontal surfaces." Foam is made up of air, a foaming agent and water. It is

scue Firefighting

the air trapped in the bubbles that gives foam its cooling ability.

The first chemical foams were developed in England in the late 1870s. The United States Army Air Corps began using chemical foams formed by reactions of such materials as aluminum sulfate or sodium bicarbonate and water, in combination with foam-stabilizing agents, in the 1930s. In 1935, the Army switched to mechanical foams where a liquid foaming agent is mixed with water and air. Examples of these mechanical foams include protein foams, which are albumin based, and fluoroprotein foams, in which glycols were added to stabilize the foam.

In the 1960s, the United States Navy, along with 3M, developed Aqueous Film Forming Foam (AFFF). AFFF is totally synthetic and contains fluorocarbon surfactants which cause a thin aqueous film to drain from the foam bubbles and float on top of the liquid hydrocarbons. This traps the vapors and results in fire extinguishment by removing the fuel source. In addition, the cooling action of the bubbles removes the heat, resulting in faster extinguishment.

Firefighting foams are generally available in 1%, 3% and 6% concentrates. The percentage refers to the number of gallons of concentrate to be mixed with water to produce 100 gallons of firefighting product. For example, one gallon of 1% AFFF concentrate is mixed with 99 gallons of water, three gallons of 3% concentrate is mixed with 97 gallons of water, or six gallons of 6% concentrate is mixed with 94 gallons of water to make 100 gallons of product. What comes out of the nozzle or turret is exactly the same. Since mobile proportioning systems cannot be accurately calibrated at the 1% level, these concentrates are utilized only in fixed-base operations such as refineries and fuel storage facilities and are not used for ARFF.

VEHICLE ADAPTATION

Many municipal fire departments are not financially able to purchase an ARFF vehicle to stand by in the event a plane crashes in their community. Therefore, agencies must determine how to adapt existing structural firefighting equipment for ARFF.

One of the simplest and least expensive methods is calculation of the booster tank foam recipe for your equipment. This involves taking the capacity of the on-board water tank on the fire truck, calculating the amount of foam concentrate needed, and then storing it on the truck ready for use. For example, a 500-gallon booster tank would require 15 gallons or three 5-gallon buckets of 3% AFFF concentrate. Placed in the

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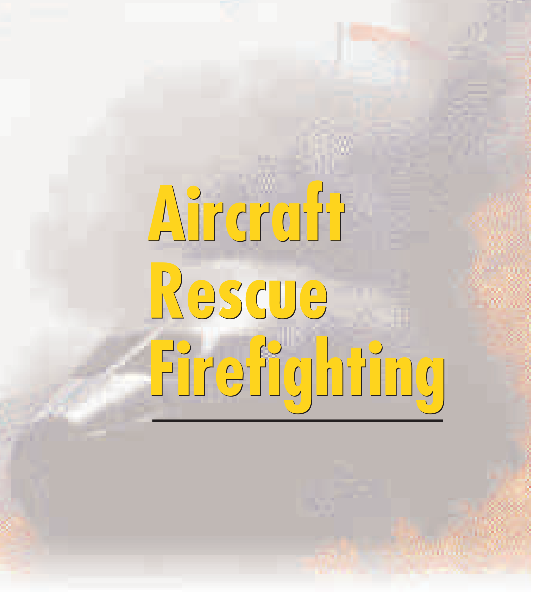

Aircraft Rescue Firefighting

> *Aircraft landing gears are made of materials that will burn at extreme temperatures and react violently if extinguishment with water or foam is attempted.*

hose bed near the tank fill, the foam concentrate could be dumped into the tank before the apparatus departs. The drive to the scene would sufficiently mix the water and concentrate to produce 500 gallons of pre-mix. With a standard water fog nozzle, this would produce the firefighting equivalent of 1,500-3,000 gallons of firefighting product. If an air aspirating nozzle was utilized, then the coverage would approximate 1,500-7,500 gallons.[3] Firefighters should be familiar with, and have available, foam eductors and a supply of foam concentrate at the scene to continue firefighting efforts.

Although it is possible, but not desirable, to apply protein foams along with AFFF on the same fire, water should never be applied to a foam blanket as it will dilute and wash away the protection. It is also important not to mix different types of foam concentrates together. To insure the safety of rescuers and to prevent possible reignition of fuel vapors, when the foam blanket has dissipated, it should be replenished. A visible and complete foam blanket is necessary to insure vapor suppression.

RESPONSE PLANNING

Off-airport aircraft emergencies fall into four categories: low-impact crashes, high-impact crashes, mid-air break up and crashes into water.

In a low-impact crash, the pilot is able to make a fairly controlled landing and the fuselage remains relatively intact. There may be an associated fuel fire. Responders will treat a large number of survivors suffering from force injuries and burns. The local EMS system will be overloaded. A wide body jet may carry up to 400 passengers, and appropriate hospital beds will have to be located.

In a high-impact crash, the forces involved are much greater and there will be few, if any, survivors. The stress on responders increases as it becomes apparent that few lives can be saved. The clean-up operation, body recovery and identification process will tax the local medical examiner or coroner's staff.

If the aircraft breaks up in mid-air due to an explosion or collision, aircraft wreckage and bodies may be spread over a wide area. If the aircraft lands in water, reaching the fuselage, rescuing survivors and combating a fire will be difficult. In these cases, even a shallow water crash will have severe environmental consequences.

Response planning should include designation of primary and back-up locations for triage and treatment of victims. Suddenly you are faced with 325 victims with injuries ranging from minor abrasions to fractures, burns and major trauma. Where will you treat them? How many hospital beds are available? How will you transport patients?

> *In a high-impact crash, the forces involved are much greater and there will be few, if any, survivors. The stress on responders increases as it becomes apparent that few lives can be saved.*

Devise a plan and conduct a tabletop exercise to test it. Include neighboring fire, EMS and law enforcement agencies in your exercise. Disaster drills and exercises are the time to work out mutual aid bugs. Also, contact the local funeral home association to assist in planning for a multiple fatalities incident. Contact state and federal agencies for potential sources of assistance, from FAA Planning Guides to DMAT Teams.

In any event, responders to an aircraft crash will have to take special precautions to protect themselves. Beyond the obvious danger of fire, unburned jet fuel is a carcinogen that can be absorbed through the skin; prolonged inhalation of vapors can lead to development of chemical pneumonia; and some equipment can be permanently contaminated if it comes into contact with fuel.

Aircraft fuselage may produce sharp edges that can easily tear through bunker gear. Aircraft landing gears are made of materials that will burn at extreme temperatures and react violently if extinguishment with water or foam is attempted. Aircraft engines may continue to operate for some minutes after a crash, even if they have become dislodged. In an emergency landing or low impact crash, jet turbines may produce sufficient thrust to overturn responding apparatus and suck in loose equipment or even personnel who get too close. A bump against a propeller can restart a reciprocating engine if it has not been properly shut down. Pressurized lines and containers may contain fluids or gases at extremely high pressures. Some of the fluids may be flammable or toxic. In older aircraft, oxygen may be distributed from central tanks through pressurized lines. Surface control cables can be under extreme tension, and if cut, may react with enough released energy to cause serious injury or death. Electrical lines may remain energized.

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when cut by a power saw can release dangerous dust and micro fibers. Responders must also take care to avoid the biohazard dangers presented by body parts and fluids, and to avoid unnecessary contamination of equipment by carefully choosing equipment staging sites. A decontamination station for personnel and equipment should be established, and a perimeter established to prevent cross contamination.

During and following ARFF operations, it is important to remember that a plane crash is a crime scene until proven otherwise. A number of local, state and federal law enforcement agencies will be involved in the investigation into the cause of the crash. Responders should take care not to unnecessarily disturb aircraft parts. If it is necessary to move something in order to accomplish rescue or fire extinguishment, then try to remember the original location or orientation of the part and convey that information to investigators. Above all—no souvenir hunting! A perimeter should be quickly established and only those persons actively involved in the operation should be permitted access. Preventing unauthorized access is infinitely easier than clearing the area of bystanders later.

Before recovery of bodies or body parts commences, photographs should be taken to document their location in relation to the aircraft and surrounding area. This documentation may assist in identification of parts and research into what steps can be taken to improve crash survivability in the future.

All involved personnel should be strongly encouraged, if not mandated, to participate in Post Incident Stress Debriefing. This type of incident exposes responders to a situation outside of normal human experience and long-term mental health dangers cannot be overlooked. Recovery of the community should also be encouraged. As soon as possible following the event and investigation, clean-up of the area and restoration to pre-crash conditions should be accomplished. Residents should be offered counseling and be involved in the restoration in order to restore a sense of control.

An airplane crash is not simply a big automobile accident. The combination of a massive, three-dimensional liquid hydrocarbon fire, a widespread trauma and burn MCI, and a high-profile media event makes this an extremely difficult situation to prepare for. However, the careful planning and training you will do in order to deal effectively with this type of event will also improve your response to other types of emergencies.

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Choosing the Correct Apparatus Monitor

By Don Sjolin of Elkhart Brass Mfg. Co., Inc.

Picture courtesy of Elkhart Brass Mfg. Co., Inc.

NEGOTIATING ONE'S WAY THROUGH the path of choosing a monitor that is correct for one's application can be somewhat confusing due to the many choices. However, the process is simplified greatly with a general knowledge of the possible categories of which monitors can be grouped. The purpose of this article is to provide a monitor overview to assist in the selection process.

From a general perspective, monitors can be categorized into two broad application uses. The first category is fixed mounted monitors, usually made of brass or stainless steel, for use in industrial fire protection systems in such locations as oil and chemical processing facilities. The second, main category of monitors is for use with fire apparatus vehicles or sometime referred to as fire appliances. These are constructed of lighter weight materials, normally aluminum alloys to aid in reducing overall vehicle weight. It is this later category that will be the focus of this article.

Within this general vehicle category, we can further divide monitors into five subgroups depending on intended use:

- Aerial devices
- Top mounted Deck Guns
- Bumper/Turret mounted
- Portable
- Hybrid type

Weight considerations are extremely important for monitors that are mounted at the end of aerial devices. They are used for pre-piped telescoping waterways with typical flow rates of 1000 GPM (3,785 LPM) to 2000 GPM (7,570 LPM). Basically, these monitors are used as the master stream device, flowing water rather than foam, in a defensive fire operation. Pump requirements to provide adequate pressure at the end of a long aerial are demanding, therefore the internal efficiency or friction loss of the monitor should be carefully considered. Because of monitor location at the end of the ladder or basket, multiple electronic control capability, from both the ladder and from the base of the pedestal on the vehicle, is very commonly accomplished by hard wire electric cabling or radio frequency wireless. Multiple travel stops and the ability to stow to a preset position are other common features of aerial monitors.

Picture courtesy of Elkhart Brass Mfg. Co., Inc.

The second, sub-group of monitors are deck guns. Employed for quick knockdown or as a master stream in defensive roles, the typical flow rates of these monitors are from 500 GPM (1,892 LPM) to 2000 GPM (7,570 LPM). Both water and foam capabilities are needed with foam being supplied by an internal vehicle proportioning system or through a foam educting nozzle. A popular component to a deck gun is an extension device to provide a means to extend the height of the gun above top of vehicle obstructions. While traditionally hand extended, electronic extenders are now available that raise the gun at the push of a button.

Bumper or turret monitors are

Picture courtesy of Elkhart Brass Mfg. Co., Inc.

identified by the fact that they are typically operated from within the vehicle, often by the vehicle's driver. These monitors are normally electric controlled by either joysticks or toggle switches with a manual override. The bumper units are in fact mounted on the bumper of the vehicles with typical flows of 15 GPM (56LPM) to 500 GPM (1,892 LPM). Applications for these monitors vary significantly and include such areas as forestry/wild land. For a very specialized application, ARFF (Aircraft Rescue and Fire Fighting) vehicles utilize turret mounted monitors, some with hydraulic controls systems.

Picture courtesy of Elkhart Brass Mfg. Co., Inc.

Increasingly gaining in number of units deployed, portable monitors allow high flows in areas not accessible to the apparatus deck gun. Lightweight offensive units are used for initial rapid attack, thus, issues such as weight and speed of set-up are of utmost importance. Many times, these monitors are pre-connected to hose lines for quick deployment. Lightweight monitors can even be utilized in interior attacks. Since these units are ground positioned, a wide footprint is essential to provide stability and safety on uneven surfaces. Typical flow rates are in the range of 500 GPM. Larger portable monitors take on more of a defensive role, handling exposure control

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with higher flow rates up to 1250 GPM.

The last sub-group is a hybrid of the deck gun and portable monitor. This versatile device functions as a deck gun that can be detached and deployed also as a portable ground monitor. These can be either manual, electronic or radio frequency wireless. Flow rates vary from 350 GPM (1,325 LPM) to 1250 GPM (4,731 LPM).

The subject of monitor controls deserves its own discussion. Control options are greater than ever and should be considered not merely a matter of personal preference but integral to a department's operational goals for efficiency and safety.

Most are familiar with manual control; however options and considerations still exist. The most important of which is assuring ergonomic and safe operating conditions. The inherent placement of a monitor atop an apparatus creates the potential for pinch points as wells as falls. The two most common manual monitor control configurations are 1) tiller and 2) geared hand wheel. Tiller control allows the monitor to be positioned very quickly but compared to hand wheel control can require greater operating force. Hand wheel controls generally remain stationary at the back of the monitor letting the operator remain in place as the stream is directed while tiller control requires the operator to move with the monitor.

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Electric controls offer a significant advantage in regards to safety. Typically the control point for an electrically operated monitor is at the pump panel. Employing electric control, the firefighter is not required to climb atop the apparatus to operate the monitor. The United States' National Fire Protection Association, in it's guidelines for apparatus construction, recommends the use of remotely operated monitors "without the need for a person to climb to the top of the apparatus". Electric control also allows control from multiple locations around or on the apparatus. Multiple control points are most often specified for aerials driven by the need to provide monitor control in the bucket as well as at the pump panel. The actual operator interface for an electric monitor can vary from simple toggle switches to an integrated multi-function joystick. During specification, consideration should be given to the size of monitor required as well as control locations to assure the vehicle's electrical power and wiring provisions can accommodate the monitor.

Hydraulic and pneumatic controls offer largely the same benefits as electric control and were really the earliest options fitted. With the ever increasing flexibility of electric controls, hydraulics and pneumatics offer little to justify their cost and demanding maintenance.

As with nearly everything else, fire monitors are now also available with wireless control. Wireless control essentially provides all the advantages of an electric monitor while further allowing the operator to be positioned away from the apparatus altogether. Freed from his position at the apparatus, a firefighter can better site the monitor stream, remain in a safer less congested area, and perform other fire ground tasks. Because they typically utilize more advance controls, wireless monitors often also provide features such as automatic stow, programmable stops, multiple travel speeds, and programmable oscillation. While the wireless technology required in firefighting monitors might not be considered leading edge by consumer electronic standards, the application to firefighting can be challenging.

Picture courtesy of Elkhart Brass Mfg. Co., Inc.

Apparatus specifications should demand that the wireless system has been properly design and configured for use in firefighting. In many applications wireless control can actually be an economic decision. In the case of aerials, where multiple control points and long cable runs can drive up the cost of a traditional hardwired electrical control system, wireless monitors are often lest costly overall.

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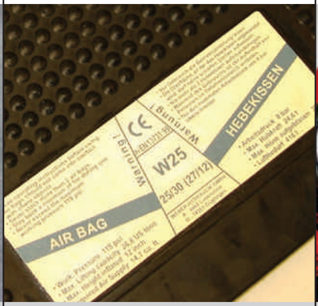

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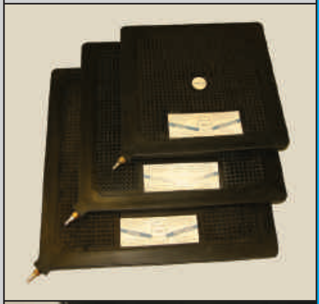

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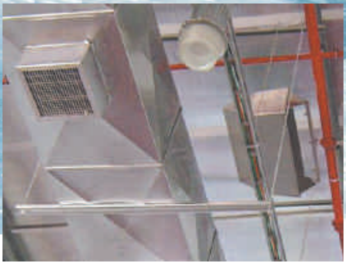
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Large-Scale Storage Tank Fire Fighting

By Mike Willson of Angus Fire

Foam blanket of Angus FP70 projected onto the roof of a 20 metre high 65 m dia. open top floating roof tank by their Colossus 15,000 litre/minute monitor based 50 metres away from base of tank

BULK STORAGE TANK FIRES are amongst the most difficult flammable liquid fires that professional firefighters can face. Not only are they huge in area, but also very hot, often burning for hours or even days before resources can be marshalled to launch a foam attack.

FIXED SYSTEMS PROVIDE SIMPLEST ANSWER

The easiest and most reliable way to protect bulk storage tanks is with a well designed and properly maintained, fixed foam system that will take a prescribed course of action to quickly deliver foam onto the tank. This can be through well designed top pouring, rimseal or base injection equipment depending on the contents and tank design. These systems can be automated using linear heat detection or alternative heat sensing devices. These detect the fire and automatically activate the foam systems through actuated valves and pipework systems that divert foam to the relevant tank from a centralised storage and proportioning system.

Whilst this is the preferred and most effective method of protecting bulk storage tanks, there are many storage tanks where no such systems have been fitted. Some systems can be retro-fitted to such tanks, but many installations rely on mobile monitors to provide a more flexible solution. These can be set up and used on any of the tanks in the tank farm or adjacent areas. While this is often regarded as more cost-effective, it often requires more expertise to operate effectively and more financial and time investment during the fire.

Large 400m² fire quickly extinguished by Angus Fire's Colossus aspirated cannon and FP70 foam

SURROUND AND DROWN METHOD OUTDATED

The old style "surround and drown" approach involves several small flow monitors around the tank projecting foam into the tank. This has been shown to be outdated, labour intensive and not as efficient as the modern and now widely accepted large capacity monitor strategy.

LARGE CAPACITY MONITORS ARE WAY FORWARD

Modern firefighters have shown that one or two large capacity monitors of typical capacity 15,000 litres/minute capacity and upwards offer the best answer.

It works by delivering a locally high application rate of foam into the "wind tunnel" around the periphery of the tank where air is drawn down onto the fuel surface to sustain the fire. This

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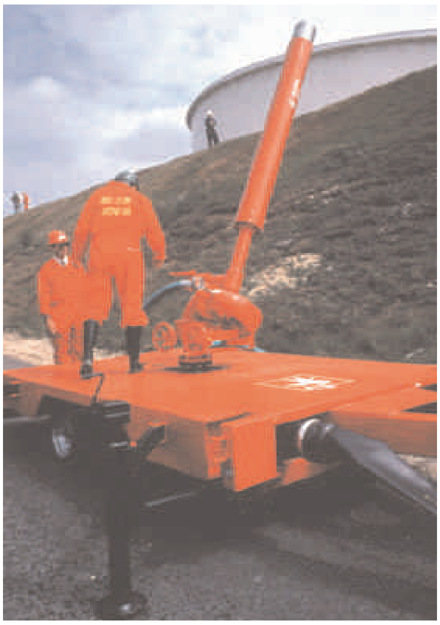

15,000 litre/minute Colossus monitor for tank firefighting

enables the foam to establish a bridgehead against the fire from which it can spread out and seal against the tank shell. The average size for bulk hydrocarbon storage tanks is about 60-75 metres in diameter, with the biggest being a colossal 110m (360 ft) diameter with a huge 9,500m^2 surface area – more than two football pitches! Special measures need to be taken to enable such monitors to tackle such a blaze.

FLUOROPROTEINS THE FOAM OF CHOICE

Modern high performance FluoroProtein foams like FP70 Plus are the most cost effective answer for storage tank fire fighting. This has been clearly demonstrated against the oil industry's own specialised LASTFIRE test for this application, often exceeding the performance of more expensive AR-AFFF type foams.

LOGISTICS IS THE KEY

When large capacity monitors are being used it is vitally important to ensure the supply logistics are kept simple and quick. Fast response logistics is the key to getting foam onto the tank quickly and effectively.

High performance large diameter 150, 200, 250 and 300mm (6″-12″) high volume (Hi-Vol) layflat hoses play a crucial role in minimising the number of hose lays. These reduce time delays, pressure losses and the confusing “spaghetti effect” of using too many small diameter hoses.

Hi-Vol hose swells slightly when pressurised. This minimises the pressure losses from the ring main system to the monitor, crucial in achieving efficient and effective foam delivery onto the tank.

Adequate water pressure is one of the key elements that can make the difference between success or failure in a monitor attack. Providing large diameter outlets from the ring main also avoids any restrictions before water flows through the Hi-Vol hose system to the large capacity monitor. This is essential in achieving an efficient systems and increases your likelyhood of success.

RAPID DEPLOYMENT AND EFFICIENT RETRIEVAL

Hi-Vol hose is heavy compared to regular 52mm or 65mm dia. attack hoses so a simple, reliable and effective deployment and retrieval system is required to take the back-ache out of handling it. Fast and Efficient Techniques for Collecting Hi-Vol (FETCH) are now available as self contained modules with their own hydraulic power packs. They can be built-in to new fire truck builds or retro-fitted into existing vehicles for a more cost-effective solution. They also enable rapid retrieval of Hi-Vol hose, once an incident or training exercise is over – crucial for tired firefighters.

NOZZLE OR CANNON?

One dilemma facing firefighters is whether to try and throw the foam as far as possible accepting the foam quality is not as good, or to use up more pressure to make a good quality foam but find it will not reach the tank.

The foam delivered must be sufficiently robust and stable to penetrate the flames, withstand the intense radiant heat from the flaming surface and cherry red tank shell, yet progressively control the fire. This means a well aspirated low expansion foam blanket.

Leading manufacturers are able to find an effective compromise where adequate foam quality and throw distance are achieved either with a semi-aspirated nozzle or with an aspirating cannon providing a more stable foam blanket.

Colossus monitor in action on hydrocarbon tank fire in Middle East

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40,000 litre/minute MEGA Colossus aspirating cannon monitor, capable of delivering a stable FP70 foam stream long distances onto large diameter floating roof tanks

Both nozzle types are represented in the LASTFIRE test and both work well. However, foams produced using the aspirated cannon type nozzle usually exhibit better foam quality which helps minimise plunging into the fuel. This reduces the fuel pick-up by the foam blanket, so the foam is more effective with less wastage. There is also less risk of flaring and flashover once the fire is extinguished that could be responsible for major re-involvement from hot metal or incandescent seal materials. The synthetic detergent based foams are more prone to this problem as they emulsify more readily when mixed with hydrocarbon fuels.

SINGLE PROPORTIONING MORE EFFICIENT

Having a single jet pump inductor or diesel driven foam pump hastens deployment of the monitor and ensure foam of the correct quality is produced. Trying to balance and bring on-stream several inductors or jet ratio controllers inevitably introduces delays and wastage of foam before any real impact can be made on the tank fire.

CONCLUSIONS

Consideration should be given to fixed foam systems to quickly take a prescribed course of action for rapid control of tank fires. Where this is impossible, well designed large capacity monitors should be chosen. Independent fire tests have shown that aspirating cannons will provide foam of a quality most likely to put the fire out and keep it out, especially when high performance FluoroProtein foams are used with associated cost benefits.

The hose system configuration selected to connect these monitors to the ring main or pumping systems is crucial and could well determine success or failure of the foam attack.

Efficient and effective modular Hi-Vol deployment and retrieval systems are necessary to provide fast response to the incident and enable foam to be delivered quickly onto the fire.

Logistics of the entire large capacity monitor package and regular training to ensure everyone knows how it all works is your key to success.

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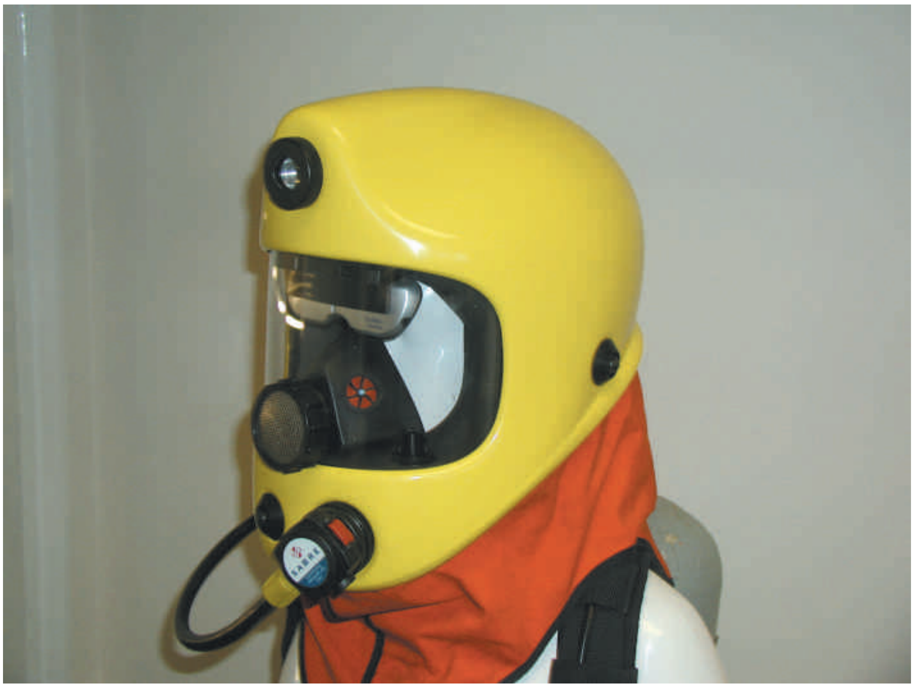

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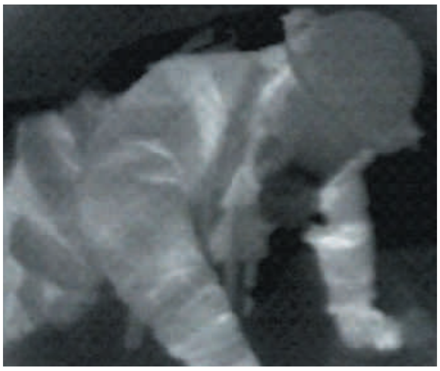
Thermal Imaging in the Fire Service

The history of TIC’s started with the huge and cumbersome hand held tics, which used a vacuum tube technology. This technology blazed a path. It opened up the possibility of giving back the fire fighter the one thing he never had and always needed, his sight in the dense darkness of a fire. These hand held cameras had their limitations. But the key *dis*advantage was that it was *hand held* and required the user to use his/her hands to operate the TIC. That disengaged the TIC user from the firefight and search & rescue rendering the user a “cameraman”. Not a truly tactical use of the technology.



Technology meets vision

2005 marks the 10th anniversary of GB SOLO Ltd selling SOLOtic’s and unlike the hand held cameras, the SOLOtic has taken HANDS FREE technology further than ever. Now utilizing the latest micro bolometer camera L3 (Raytheon) has to offer, this third generation of SOLOtic offers the same capabilities as its contemporaries with optional spot temperature indication, colour overlay and wireless transmission.

Each SOLOtic is hand built to order and each comes with a lifetime guarantee. All GB SOLO LTD ask is that once a year GB SOLO LTD must perform its annual service on the helmet.

The SOLOtic combines the use of twin electronic earphone/microphone communications which will connect to ANY radio set; it will connect to almost ANY SCBA set and utilizes a thermal display system which even when the face mask is entirely covered with smoke/debris or steam it will still relay the information the camera is detecting. This cannot be said about hand held cameras, where the user will frequently be required to wipe clean both the camera LCD display and his/her face mask (using one hand to hold the camera and the other hand to clean) leaving the fire fighter NO hands to deal with the situation he/she has been trained for!

This third generation of SOLOtic is lighter, lower in profile and more compact than its predecessor whilst actually allowing for greater user comfort due to redesigns on the forehead and chin support areas. More importantly this SOLOtic maintains the capability to be donned and completely functional with radio and SCBA hook up in less than 5 seconds, a feature, which has won the SOLOtic customers around the Globe.

One of our main sales sectors for the SOLOtic is the cruise line industry, Navies and commercial shipping companies where we supply SOLOtic’s working alongside our SOLOunifit helmet. The SOLOtic enables the user greater protection and gives the capability to fight at the seat of the blaze and to extinguish rather than contain and hold back. On a ship this can often mean the difference between loosing the vessel or not.

The SOLOtic has played a significant role in civilian fire brigades around the World and it is within these services that GB SOLO will be pushing it greatest marketing resources for the foreseeable future. This increased marketing all coincides with GB SOLO LTD now being connected with some of the best distribution partners and this has allowed the thought that the SOLOtic should be sold at a similar if not substantially lower price than most of it’s rivals. GB SOLO Ltd’s marketing department has found through research that whilst many brigades/forces main target for acquisition was the SOLOtic only 25% could afford the exclusive price tag. This is all set to change from June 05 as the SOLOtic price will reflect the more cost effective methods of production, so for the latest pricing contact your agent or GB SOLO Ltd below.

For more information, please contact:

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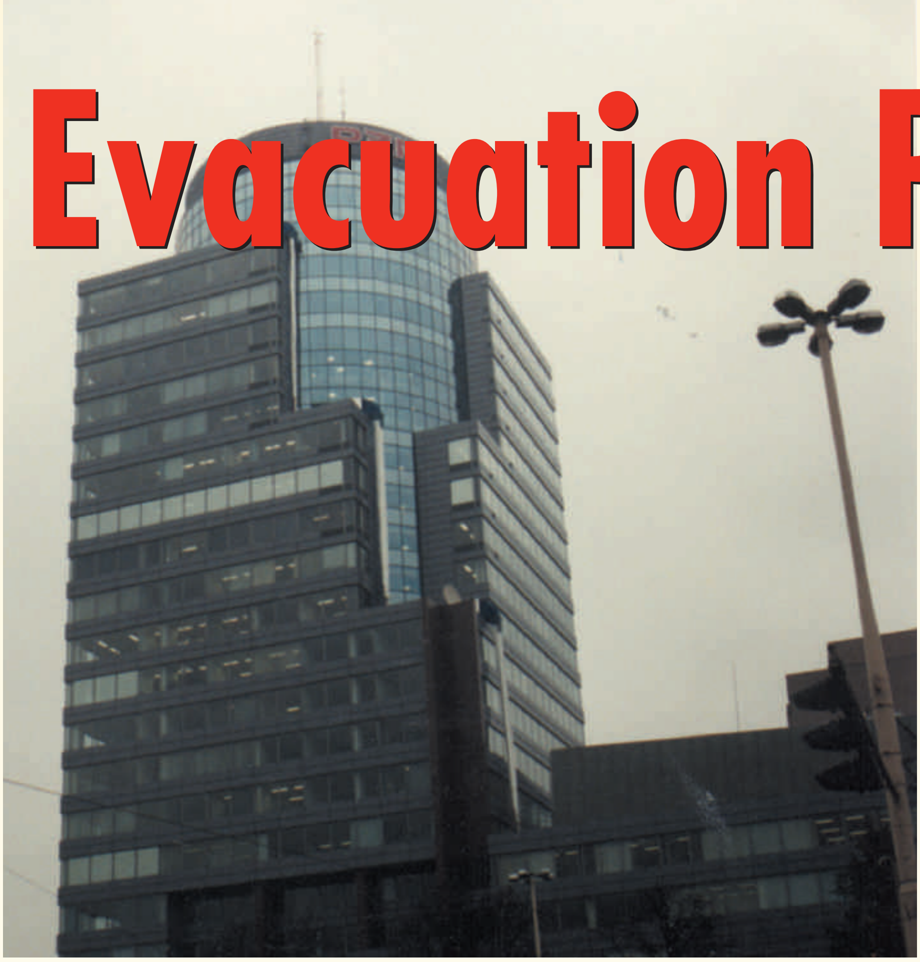
Evacuation Plan For

By John Ng
Escape Consult
Mobiltex (S) Pte Ltd



Picture courtesy of Escape Consult Mobiltex (S) Pte Ltd

THE THREAT OF FIRE or other emergencies in high-rise buildings pose deadly fire challenges to fire department. The large numbers of persons in commercial high rise buildings, the nature of the occupancy and typical building geometry that is considered by many fire professionals presents an unacceptable risk. In reality, the fire department does not have capabilities to do much of anything above the fire floors that is beyond the reach of their super aerial ladder fire trucks. So, if a fire breaks out in a building taller than that, the consequences depend entirely on the in-built safety mechanisms. One of the in-built safety mechanisms is developing an evacuation plan.

WHAT IS A HIGH BUILDING?

Most Building Code defines high buildings as those buildings with building height that are beyond the reach of the local aerial ladder fire truck. Generally, buildings of seven storeys or more in building height are considered as high buildings.

While high rise buildings are designed to be fire safe and are protected by the passive and active fire protection system, yet, high rise fire-fighting generally require more complicated operational approaches than most structure fires. It's a manpower-intensive operation. Tasks that are normally considered routine for most fire departments, such as locating and attacking the fire, evacuating occupants, and performing ventilation can become very difficult in high rises. Operations are affected by several specific challenges:

- Access to floor levels that are beyond the reach of aerial apparatus is generally limited to the interior stairways. The use of lifts is usually restricted or prohibited because of safety concerns. If the lifts are out, that meant carrying gear up and down flights of stairs and walking into a cement-walled apartment that heated up like "a furnace", and firefighters literally have to carry people who can't walk down the stairways. Rooftop helicopter rescue is dangerous.
- Hundreds or even thousands of occupants may be exposed to the products of combustion while they are evacuating or unable to descend past a fire on a lower floor. Their exits may be limited to two narrow stairways, which are also the only access for firefighters coming up to assist with evacuation and to fight the fire.
- The ability to contain and control the fire is increasingly dependent on the construction of the building and the ability of sprinkler and/or standpipe systems to deliver water to the fire area.
- Ventilation can be much more complicated and critical in high-rises than in other types of structures. Vertical ventilation is often limited to stairways or lifts shafts, both of which may also have to be used to evacuate occupants. Horizontal ventilation, by breaking out windows, presents the risk of falling glass to those outside the building. The stack effect causes smoke to rise rapidly through the vertical passages and accumulate on upper floors.

Realistically, the evacuation from high rise buildings in a major emergency can only be effectively executed if there is an evacuation plan approved by the fire department to evacuate as many people as possible, as quickly and safely as possible prior to the arrival of the firefighters. The lack of plans and procedures for evacuation can lead to confusion among the occupants in the event of a large-scale evacuation.

FACILITIES FOR AIDING BUILDING EVACUATION

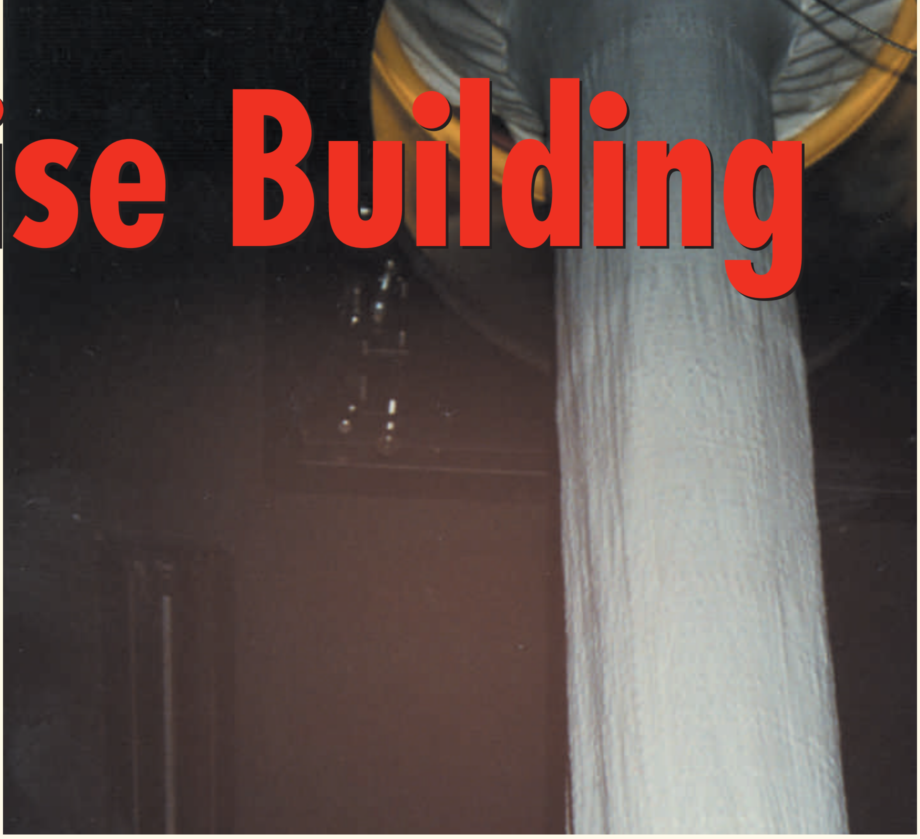
Evacuation preparedness activities are needed when mitigation measures have not prevented disasters or cannot prevent them. The preparedness phase develops plans to save lives and minimize casualties. Preparedness measures also attempts to tackle the perceived difficulties and problems of building evacuation and to assess the need to provide adequate facilities to enhance evacuation response operation.

For example, a person who has to decide how to get out of a burning building is likely to be under significant psychological and even physical stress if he/she cannot locate the escape routes when power blackout. For an escape

High Rise Building

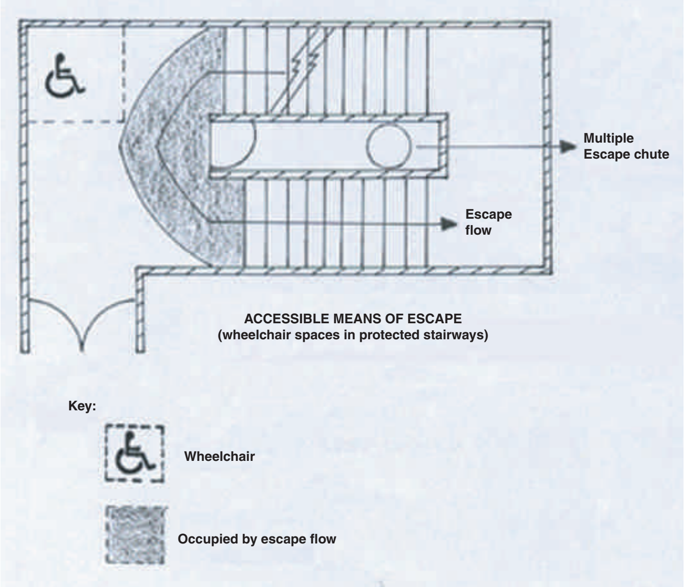
route to be effective and efficient, it is important that from anywhere in the building occupants have sight of a sign, or series of signs, which leads them to a place of safety even in complete darkness. Signs and stairways should be clearly identifiable and that each floor access is clearly numbered, and also indicating the nearest crossover floors, if certain floors are not accessible. The visibility of escape route signs will assist firefighters and other rescue teams to evacuate occupied areas during emergency situations.

Some of the facilities for aiding building evacuation that are available in the market that the author has knowledge of when writing this article are:



Picture courtesy of Escape Consult Mobiltex (S) Pte Ltd

- An audible and visual fire alarm system is to warn people of an emergency and provide a general-purpose evacuation warning.
- An adequate communication system (e.g., public address system, intercom system, and lifts telephone system) is to minimize heavy congestion on stairways by directing evacuees to move to a less congested staircase, and to quickly rescue those trapped inside the lifts.
- Fire vents that open automatically in the event of a fire, maximize fire containment and life safety and minimize damage and material loss. The vents help to improve visibility inside the building to help occupants escape the fire and reduce the risk of smoke inhalation.
- Creating better and safer protected stairwell design, such as: increasing number of exits, the width of doors, width of stairs, add on anti-slip nosing on steps of stairs, improved emergency lighting and signs, and smoke control in stairways.
- The exterior fire escape stairs provide alternative egress for occupants and can also provide firefighters with access to, and escape routes from, upper floor of the fire building, when interior stairs are sometimes untenable or inadequate.
- Emergency escape lighting, signage and safety way-guidance system, all electrically powered components with back-up power capable of being activated as directional information in the event of a power outage.
- The use of photoluminescence emergency signage and way-finding systems intended to aid in evacuation from buildings in all risk situations where smoke is present and in the event of failure of both the power and back-up power to the lighting and illuminated exit signs. The photoluminescence egress system recommends these markings to be included throughout every stairwell, including around all landing perimeters, along the full length of every handrail, on each step, and around all obstacles to egress.
- Personal 'escape smoke hood' can protect user for safe escape from smoke and fume during fire evacuation.
- Portable and lightweight evacuating chairs enable trained helpers to move people with physical handicaps down a flight of stairs much easily that might not otherwise be possible.
- Ramps can be helpful for wheelchair users in negotiating one or two steps.
- Only use the special designed 'evacuation-lift' that is approved for use in fire evacuation by the fire department.
- Only use escape chute that is accessible and usable by the greatest number of people, regardless of their capabilities, and is approved for permit safe evacuation in fire situations by fire research-testing institute. If deployed strategically inside or on the exterior walls of high building, allow people trapped in higher elevations to bypass impassable floors or blocked stairways to escape safely to the street, when building under fire (or damaged by explosions). This will give every person the ability of self-reliant escape.



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Evacuation Plan For

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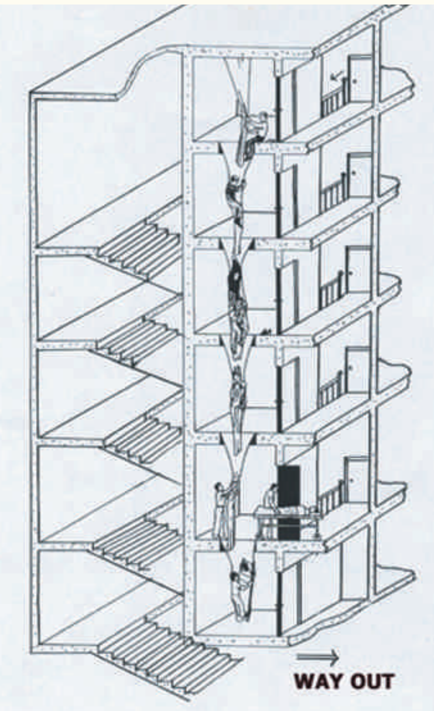
The provision of appropriate facilities for aiding evacuation provides better opportunity for a safer, quicker and orderly evacuation. More importantly, reduce building evacuation hazards and maximize the escape potential of people with disabilities of getting out alive.

DEVELOPING EVACUATION PLANS

Evacuation plans in general have always been an important operating feature of a building. Given that buildings have differences in structure design, construction, fire-resistant qualities, height, floor layout, usage, occupancy load, each building presents unique problems in emergency evacuations. For this reason, the fire department acknowledges that there is not a single recipe for handling evacuations for any one building, but the key is communication between building operators and firefighters.

A typical requirement of evacuation plans must account for a range of events and be robust enough to take all types of occupants into consideration:

- Plans should include procedures for reporting emergencies that spell out occupant and staff response. For example, if people discover a fire, immediately activate red manual call point, leave the floor, and keep stairwell doors closed but unlocked at all times to preserve the safety of escape stairways.
- The building calling for an evacuation when there is a known event. Only properly trained building manager or the chief engineer is authorized to order an evacuation on occasion when they have to make a decision ahead of the fire department. They should have the assigned authority to order evacuation of a given floor or several floors of the building to a refuge location prior to the arrival of the fire department. Additional floors, as well as total evacuation, may be evacuated at the direction of the local fire department.
- Plans for evacuation during 'bomb-threat' or 'non-fire' related emergencies should be controlled by joint decision of the police and fire department in consultation with building management and tenants' representatives.
- Plans should detail the type and coverage of a building's fire protection system and other items required by the authority having jurisdiction. If additional facilities such as equipment and escape devices that are available for aiding evacuation and rescue, it should also be included in the evacuation plan.



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- Comprehensive floor plans and diagrams for evacuation routes. Floor plans with detail reveal the number of people who work in a specific office and whether or not that office has someone with special needs. Such floor plans that are available to on scene commanders of the fire department would be an extraordinarily valuable tool for firefighters.
- Plans should include floor search to make sure that every person on a floor is aware of an emergency evacuation. The orderly movement of persons requires the utmost coordination of assigned emergency evacuation floor teams and central evacuation control. They must be encompassing, amenable to change, and applicable to a range of occupants with disabilities.
- Building control will determine the safest and most efficient means of evacuation, depending on the nature of the emergency and scope of damage. For examples, Plan-1 evacuation should be accomplished by means of stairwell and make way down; the use of lifts for 'bomb threat' emergency evacuation can also be considered, but never for fire and earthquake emergencies. Plan-2 if evacuees encounter smoke while descending one stairwell, evacuees can cross over to the alternate stairwell that lead to other floors or transfer corridors giving access to separate buildings. Plan-3 for alternative escape routes when particular circumstances warrant rerouting of occupants to bypass impassable floors or blocked stairways because of hazards, such as smoke, heat, and gasses in the evacuation route. Procedures should advise skyscraper occupants never to flee towards the roof in a fire emergency because hot gas and smoke rises. The only exception to this rule is if the building has made provision of escape chute at the rooftop as an alternative means of escape route to the street.
- Evacuation planning should take into the consideration of how people will realistically react in an emergency situation. Lives are often lost through the irrational behaviour of evacuees

triggered by panic. Because of this, proper education of occupants on abiding to evacuation procedures and escape routes during regular drills hopes to eliminate panic when people are ignorant during an emergency evacuation.

Lastly, it is the building management's responsibility and duty of care to ensure that the building evacuation plans can evacuate as many occupants including the less fortunate prior to the arrival of the fire department. If the system fails, the firefighters will then have to come to do a search and rescue for those left behind. From time to time, an evacuation plan shall be reviewed and updated as required by the authority having jurisdiction.

EVACUATION DRILLS

The purpose of an evacuation drill is not a test for egress efficiency but enable building management to see how effective the plans and fire training have been conducted, identify problem areas and highlights things that should be better.

An evacuation drill programme should be established for periodic practice of 'progressive movement' and 'total movement' of occupants under varying conditions not restricted to fires. Chances for people with disability of getting out of high rise emergencies would be greater if evacuation plans is in place that included them, and that are regularly practiced by using both announced and unannounced drills for reviewing procedures. Combine training with drills allows occupants to become familiar with the emergency procedures, and that people with disabilities and activity limitations not be excused from participating. When drills are held, all occupants must know how to evacuate via routes that deviated from their normal paths and actually entered their designated stairwell. Such practices hope to eliminate panic when people are ignorant during an emergency evacuation. For building staff and fire wardens, they must practice their duties to ensure an orderly evacuation in case of fire, panic, or other emergency. They should also be taught how to use portable fire extinguishers, in-door fire-hoses, 'egress facilities' if any, such as evacuation chairs and the escape chutes properly.

Picture courtesy of Escape Consult Mobiltex (S) Pte Ltd

The myth of evacuation time taken to empty a tall building during a fire drill cannot be a determine factor of how long it will take to evacuate the structure under actual emergency situation. When the real emergency occurs, the speed of egress can vary greatly depending on many factors, including the number of occupants, their mobility, their reaction and behaviour, visibility and accessibility of escape routes, situational conditions and the distance they must travel. Will the building staff and fire wardens know what to do and perform their duties well? Are evacuation facilities in good working conditions to facilitate speedier evacuation?

CONCLUSION

Evacuation planning takes a 'total approach' at all levels: the individual, organizational, and building environmental. Preparedness in evacuation is a proactive and efficient state of readiness for a full-scale total building evacuation. Pre-planning, adequate communications capabilities, evacuation priorities and proper skill drills help eliminate mistakes and misunderstanding in co-ordination during actual emergency evacuation. Adequate training in the proper use of equipment and facilities for aiding evacuation should be incorporated as part of the evacuation drills.

Lives are not saved by codes; they are saved because people will have decided, with the help of codes, to assume responsibility for their own safety. For example, fire escape stairwells are legal in many jurisdictions but cannot guarantee that everyone can walk down the stairs quickly without injuries during emergency evacuation. In the context of the fire code, it is not required to provide facilities in a building for escape or rescue purposes. But facilities such as escape chute could have save more lives in extreme emergencies if stakeholder chose to provide them to enable more people to get out quickly where they are not required by law.

Measuring the success of a preventive program is difficult. Nevertheless, prevention and proactive is the key objective, not reactive. A building's level of fire protection and preparedness for evacuation holds the highest level of importance for safety of the occupants and property within. Voluntary actions by stakeholders to enhance the level of safety and responsible actions taken by individuals to meet real threats have always been the best way to advance the cause of safety and preparedness for evacuation.

Respiratory Prot

SINCE THE ADVENT OF respiratory protection in the 1870s, when fire fighters utilised a simple respirator and filter, today's equipment has come to use high performance technology in demand valves, pressure reducers, face pieces and integrated electronics. The use of Self Contained Breathing Apparatus (SCBA) is considered to be a basic tool for structural fire fighting, however there are other types of Respiratory Protective Equipment (RPE) that can be very relevant in today's modern fire services and the challenges that they now face.

By Keith Gillespie of
Scott Health & Safety

Since fire services were first formed to protect small communities and developing towns and then cities, the situations and types of hazards that they face have changed as well. As people have moved into larger urban communities and are living more densely, buildings have increased in both size and height. Populations have grown with more people now living in rural areas where previously natural fires could burn without needing to be checked. These fires now need to be fought to protect human life and property. In recent years the threat of terrorism has led to solutions where respiratory protection may be required for a prolonged period without the hazards of fire or oxygen deficiency. There is also an increased need for urban search and rescue operations.

At this point an explanation of the types of RPE available would assist fire fighters in making the correct choice for the situation at hand. So let's start at the beginning.

RPE comprise two main types: 'air supplied' and 'air purifying', both can be 'self contained' and 'non-self contained', as shown in diagram 1.

Air-supplied RPE supply the user with air from a source independent of the ambient atmosphere. Below is a brief description of the types detailed in the diagrams.

Self-contained RPE are made up of either 'open-circuit' or 'closed-circuit' types. An open circuit apparatus releases all exhaled air into the atmosphere through an exhale valve in the face piece and provides the user with clean air to breathe via a filter or air supplied unit. The closed-circuit system does not release the exhaled air, but recirculates it through the apparatus and removes CO_2 from the exhaled air. Oxygen is then added back into the circuit so the recycled air can be re-breathed. Open-circuit RPE are of either 'filter' or 'compressed air breathing apparatus' (CABA) types or 'fresh air breathing apparatus' (FABA) varieties. CABA are what fire fighters use for most common applications.

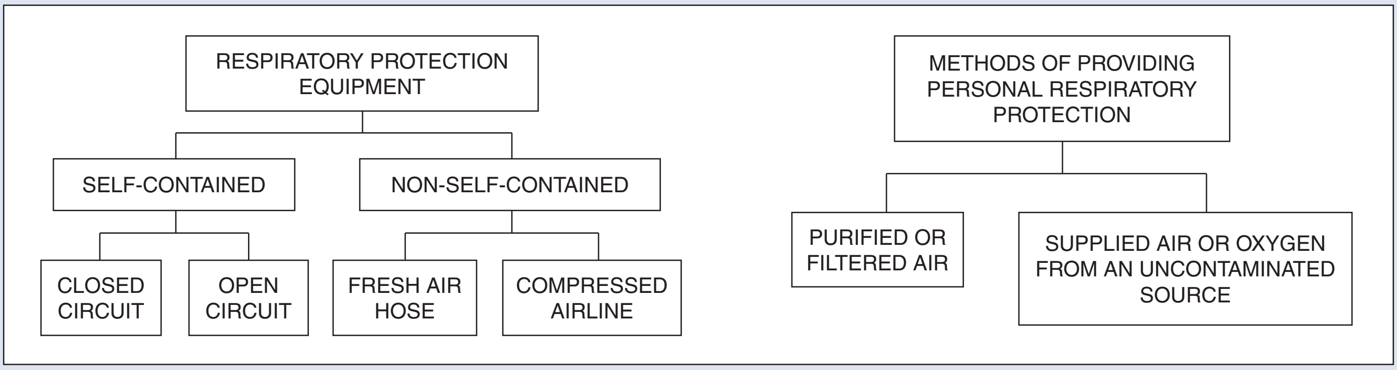
Non-self contained RPE consist of an external air source, i.e., fresh air hose, or compressed air being supplied from cylinder(s), airline trolley or a compressor. Most fire fighters would previously not have considered this type of product as suitable for traditional applications. They are however ideal for the newest scenarios of urban search and rescue, confined space entry, prolonged decontamination, ladder platform operations, and generally where conventional SCBA are not appropriate due to either size, duration or condition restrictions.

AIR PURIFYING RESPIRATORS

Air purifying, as the name suggests is a method of taking the ambient air and purifying it so that it can be used for respiration, it relies on a filtering mechanism. These filters are used in personal protection equipment (PPE) defined as negative pressure and powered air purifying respirators (PAPR)

Filter technology is becoming more advanced but does have limitations, most notably, filters should not be used in atmospheres that are suspected or could be Immediately Dangerous to Life or Health (IDLH), oxygen deficient, where the ambient or contaminant conditions are unknown, or in confined spaces such as sewers and tanks. There are however, many benefits like task specific head piece designs that are lightweight, durable, lower cost, compact, or require less maintenance. Therefore, it is worth recounting the types of filters.

Particle filters are approved to P1, P2 or P3 categories, being a measure of the efficiency of the filter media, also with reference to the relative limited capability of the mask.


RESPIRATORY PROTECTION EQUIPMENT
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NON-SELF-CONTAINED
CLOSED CIRCUIT
OPEN CIRCUIT
FRESH AIR HOSE
COMPRESSED AIRLINE
METHODS OF PROVIDING PERSONAL RESPIRATORY PROTECTION
PURIFIED OR FILTERED AIR
SUPPLIED AIR OR OXYGEN FROM AN UNCONTAMINATED SOURCE

ection Explained

Pic courtesy of Scott Health & Safety

By definition P1 and P2 filter classifications account for the level efficiency associated with the face piece style and filter media. For example, P1 and P2 are the highest ratings a half mask can be given. P1 (solid particles of inert substances) relates to 80% efficiency, while P2 (solid and liquid particles of low toxic substances) relates to 94% efficiency.

A P3 classification can only be achieved with full-face negative pressure face pieces and PAPR units, and relates to 99.95% filtration success of solid and liquid particles of a toxic and highly toxic substances, for example: smoke, off-gassing in wildfires, radioactive and toxic particles, as well as micro-organisms such bacteria, viruses, and enzymes.

Gas filters are manufactured from activated carbon. The efficiency of a gas filter is dependant upon the filtering surface, carbon volume, granule size and pores in the carbon, the physical adsorption and the chemical absorption. Specific filter are designed for particular gases, eg organic, inorganic, acids and ammonia.

The gas life of a filter is often difficult to determine. Factors such as humidity, temperature, breathing rate and gas concentration will all affect filter life. Caution should be used in trying to calculate filter life as very often halving the concentration will less than double the gas life. The filter should be replaced BEFORE the filter life is exhausted to prevent any contaminant exposure to the wearer.

POWERED RESPIRATORS

PAPR units essentially pull air through the filter media and deliver the purified air into the user's mask or head covering, at typically 120-200 litres per minute. Due to the benefits of positive flow rates and lower breathing resistance, the availability of task designed head-tops (forensic, laboratory, infectious disease and many more) and compatibility with special apparel, the future will see more PAPR units used in certain response scenarios, such as CBRN and spill containment.

These types of equipment however, can be suitable for decontamination procedures and for fire fighters who are working in the warm and cool zones of an area that have been subjected to a 'Chemical Biological Radioactive Nuclear' (CBRN) attack. They could also be ideal for situations such as wildfires. Work-studies are ongoing to determine what gases are present during the burn and the effectiveness of various types of RPE.

SCBA

When first used in the 1920s, CABA duration was approximately 20 minutes. Since this time, major advances have taken place. Cylinder technology has developed from heavy steel to alloy steel, aluminium, glass-hoop wrapped aluminium and glass full-wrapped cylinders, to the current technology of fully wrapped carbon fibre cylinders with steel, alloy or plastic liners. In most cases, the maximum filling pressure is either 200 or 300 bar. As well as cylinder advances, CABA have moved from negative pressure to positive pressure via a manual switching mechanism, to the current first breath activated positive pressure systems.

Harnesses have also changed to be much more flame resistant, being manufactured from Kevlar material. When designing an apparatus there is now also more emphasis on materials that will be resistant to the substances used in a CBRN attack.

Mask design has also improved with the utilisation of superior materials, enhanced visor profiles to increase vision, greatly improved speech diaphragms, and voice amplifiers and communications devices that can be integrated onto and into the mask. When speech enhancements such as amplifiers or communication devices are utilised consideration should be given to flame retardancy and intrinsic safety. Many of the devices currently available offer apparent speech enhancement without any consideration to the flame testing requirements of the mask and the environment it is used in, hence, loss of communication can occur in severe environments.

The introduction of 'Integrated Electronics and Information Systems' includes integrated 'automatic distress signal units' (ADSU), otherwise known as 'personal alert safety system' (PASS) devices; digital pressure gauges; temperature sensors (important as the latest personal protective equipment (PPE)

Pic courtesy of Scott Health & Safety

protects the fire fighter from the outside environment to such an extent that he does not know the heat he is actually in); automatic breathing duration calculations (time to whistle); and specified alarm points. These features are stand-alone on the SCBA.

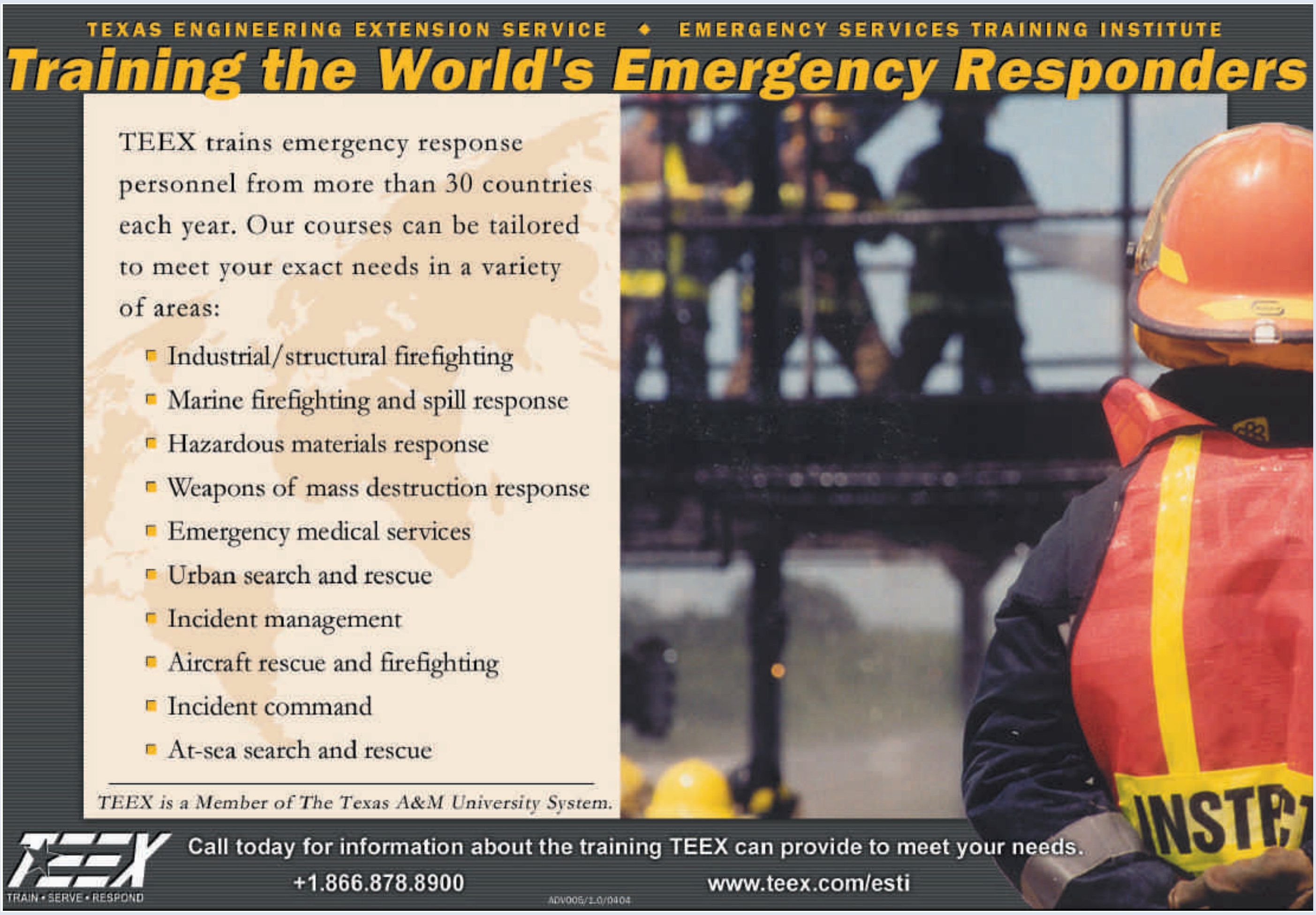
Recently a major advance has been the ability to transfer the data via telemetry to a base station. The base station provides the officer in charge or breathing apparatus (BA) controller critical information enabling him to make informed decisions on the fire ground or at an incident command post.

One of the major challenges for manufacturers is finding suitable battery technology that performs in the fire fighter's environment, while maintaining complete functionality. In order to maintain the intrinsic safety requirements, specific battery brands and models might be recommended. If not the intrinsic safety approval may be reduced or not apparent. Even though electronic interfaces provide desired data, the essential function of the SCBA must not be compromised. For example, should a battery be discharged for whatever reason, the SCBA must still be able to function utilising its standard pneumatic systems, including analogue pressure gauges and low air warning devices. When selecting telemetry equipment consideration should be given to the availability of a suitable approved frequency with the relevant local authorities

The future of telemetry information systems, team coordination, controlling crews, communication, 3D mapping, and crews moving through an incident are all ultimately guided by their true cost and how these funds are made available from treasury. The challenge for fire fighters is to present the strongest possible case in order to access the latest in life saving technology.

AIR QUALITY

Technology has advanced considerably over the last few years for RPE, however, little attention has been given by fire departments when refilling or recharging BA cylinders. At present many brigades test the air quality of their compressors after a certain time period or number of hours the compressor has been used. Little has been done to prevent the BA officer/technician inadvertently filling a cylinder with potentially contaminated. An air quality check that may have been performed earlier that day, may be of a satisfactory standard, however, the compressor could be compromised later by many factors, including, the location of on-board compressors in relation to the



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Scott Revolveair
Pic courtesy of Scott Health & Safety

incident passing vehicles expelling exhaust fumes, or a compressor operator who may have unwittingly placed the intake in the vicinity of fumes or exhaust. The compressor needs to have a device which constantly monitors the air quality, and that immediately shuts it down before any contaminated air enters the cylinder.

Cylinder failure rarely occurs during recharging, however, instances have occurred with catastrophic consequences. Many compressors are located outside a facility and the recharging of cylinders undertaken inside sometimes with the cylinder in a bath of water or behind a barrier, which is usually un-engineered. Such equipment is unlikely to be available on mobile BA or Hazmat response vehicle. Current best practice is the utilisation of a containment facility that provides assured protection for personnel and plant. The Scott Revolveair is an example of what can be fitted to any brand of compressor.

CONCLUSION

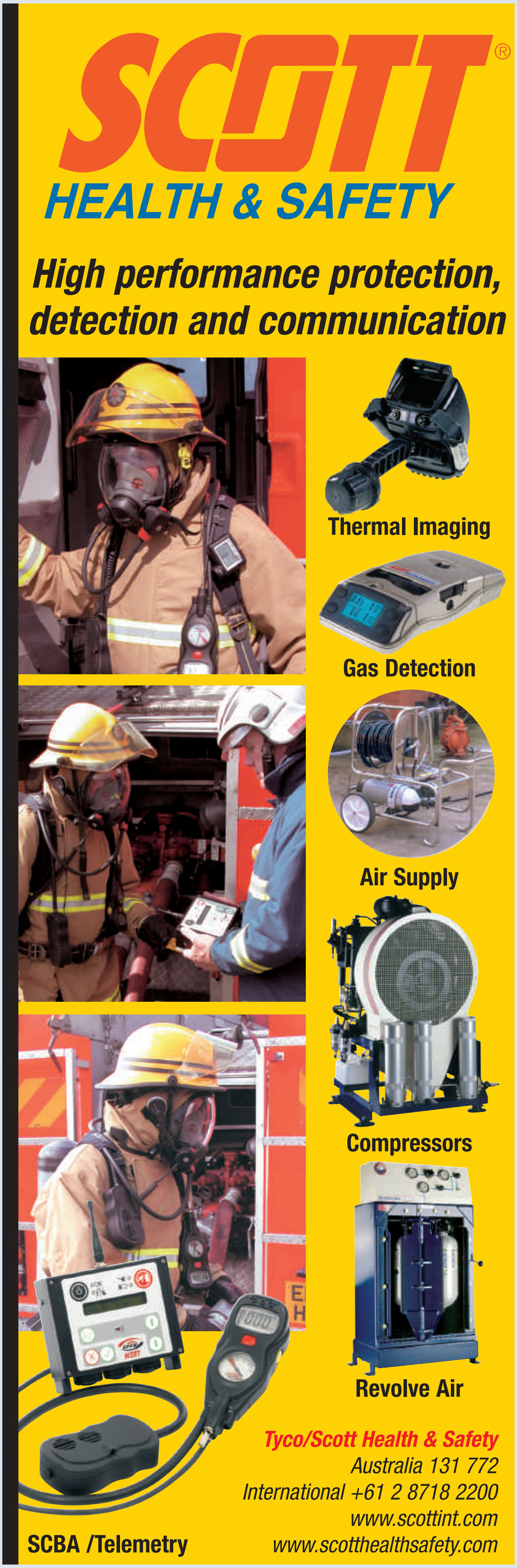
Ultimately fire fighters of today have never been better protected against the external environment in terms of respiratory protection. Despite this, the introduction of new technology, including telemetry systems on SCBA, can sometimes confuse or be daunting to purchasers within fire brigades.

The primary purpose of breathing apparatus and other types of respiratory protective equipment used in the fire service is clear – "to offer respiratory protection to the user and allow access to non-respirable or contaminated atmospheres for rescue and fire fighting procedures".

It is important to remember that this is the primary function of the RPE, as over the years these types of equipment have had new technologies introduced to them that appear to add many extra features, some of which may or may not be relevant to all. Whilst it is not suggested for a minute that fire brigades shouldn't utilise the latest technology to the fullest, they should also not forget the primary function of SCBA and other RPE or neglect back up mechanisms such as analogue gauges and pneumatic warning devices.

At the same time they should not lose sight of what technology can do to enhance the SCBA or of the benefits that it can bring.

Keith Gillespie has worked in the fire and safety industry for more than 20 years as an Aviation Fire Fighter, BA technician through to his current position as Product Specialist for air supplied respiratory products with Scott Health & Safety. kgillespie@tycoint.com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Training Centr

CIVIL DEFENCE ACADEMY

SINGAPORE CIVIL DEFENCE FORCE

Officially opened on 26 Mar 1999, the 11 hectare Civil Defence Academy (CDA) of the Singapore Civil Defence Force (SCDF) offers rescue and firefighting training in a realistic, yet safe learning environment.

At the heart of its training grounds is its 10-storey "Furnace" where a multitude of fire fighting and rescue training can take place simultaneously. Built to withstand the burning heat of fires, up 1,000 degrees Celsius, the Furnace offers a range of fire fighting environments at the push of a button all under one roof. Fire and rescue trainees get to fight not only life-like simulated residential apartment fires, but also a host of many others including fiery blazes in a ship engine room, hotel room, HazMat storage room and even a flash-over fire in a Karaoke Lounge.

Through a centralized control system, instructors have full control of the fire, heat and smoke conditions in the building. Trainees can also be monitored for safety, via a network of closed-circuit televisions and thermal image cameras.

The Academy also offers a host of other state-of-the-art training simulators which provide realistic scenario-based outdoor training. This includes the Ship Simulator, Breathing Apparatus Maze, Oil Storage Tank Simulator, 3-storey Industrial Complex Simulator, Industrial Rescue Tower, Car Fire Training Simulator, LPG Bullet Tank and Transformer Fire Simulator.

International Urban Search and Rescue Course

The Civil Defence Academy (CDA) conducted its 1st International Urban Search and Rescue Course (IUSAR) in Oct 1999. This first batch of 14 trainees came from Australia, Brunei and Thailand. This course has since trained close to 400 participants from 44 countries.

The two-week course includes lectures on the concepts and principles in managing rescue operations in USAR settings, as well as physical exercises to impart specialised rescue skills and techniques, including shoring, debris tunneling, search procedures with breathing apparatus, collapsed building rescue, medical procedures and high angle rescue. The course includes a high-strung overnight exercise to test all they have learnt during the training.

High Angle Rescue Training

The CDA works closely with both local and overseas agencies to provide international participants easy access to the IUSAR Course, including the Asian Disaster Reduction Centre (ADRC), Asian Network of Major Cities 21 (ANMC21), Fire and Emergency Services Authority of Australia (FESA), and Japan International Cooperation Agency (JICA).

If you wish to find out more about the course, and other programmes that are available, please feel free to contact the Academy's Corporate Affairs Branch at Tel: +65-6-794-5502 Fax: +65-6-794-5591 or direct your emails to SCDF_CDA@scdf.gov.sg

FIRE SAFETY ENGINEERING COLLEGE

History

The first students enrolled at the Fire Safety Engineering College on the 15th November 1997.

It was an extremely eventful day as the first 'breaking of ground' took place only in August 1996 and the design, planning, construction and recruiting of high level teaching staff was achieved in little more than twelve months.

By the time the Fire Safety Engineering College had it's special Preview Day in December 1997 for potential customers, VIP's and officials, the grounds had been landscaped, all the training rigs were ready, as was the parade ground, lagoon and motorway section.

About Us

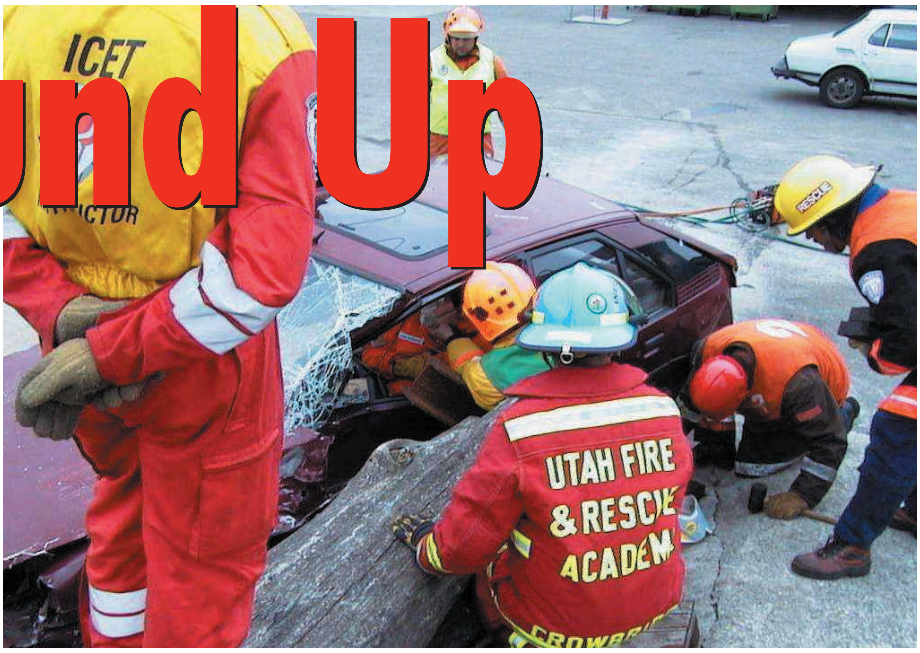
The Fire Safety Engineering College is an exciting new institution. Unique in this part of the world, the College offers students the opportunity to develop the practical skills and knowledge required for a career in Fire Safety Engineering and Management or Well Engineering. Located on a 100-acre site close to Seeb International Airport in Muscat, Sultanate of Oman, the College boasts state-of-the-art training facilities. All classrooms are fitted with the latest audio-visual aids and equipment and presentations to students are delivered via the latest computerised technology.

The College also has a unique practical fire and safety training ground. It allows students the opportunity to experience real life fire and emergency situations, utilising a full size steel framed aircraft, a helicopter, a military jet, a breathing apparatus training facility, a mini refinery with petrochemical and liquified petroleum gas and liquified natural gas training simulators. The Well Engineering School has a 1200 metre deep well, the TRAINWELL.

Accreditation

The College has a policy of obtaining third party accreditation from professional

es Round Up



institutions of national and/or international repute.

For further information, please contact:
Mr. John Whitehead
Sales, Marketing & Business
Development Manager
P O Box 2511, PC 111
Seeb
Sultanate of Oman
Tel: +968 521077 or +968 521256
Fax: +968 521355 or +968 521042
E-mail: johnw@fsecoman.com
Website: www.fsecoman.com

ICET

International Centre for Emergency Techniques

The International Centre for Emergency techniques (ICET) is a specialist of world renown in the development of multidisciplinary rescue training and consultancy programmes. ICET created the Systematic Approach to Victim Entrapment Rescue, SAVER™. This method is a truly interactive and universal approach to this demanding form of rescue.

ICET 's consultancy department has assisted numerous local and national governments; as well NGO's in developing programmes to establish, support and upgrade emergency response networks. Under its RENU™ programme ICET has worked in countries as diverse as India, Argentina, Russian Federation, Belgium, the Netherlands and Turkey.

Recently, the SAVER Foundation incorporated the SAVER approach for further research and development. Emergency Medicine Prof. Dr. Marc Sabbe (Brussels) is Chairman of the Foundation.

ICET HQ

Today, ICET is an international provider of technical assistance and training and the international representative of SAVER. In 2003, SAVER released a CD Rom which can be ordered at a pre-registration price of €48,50 less 20% at info@savertraining.org.

ICET most recently introduced training course is called "Command and Coordination for incident commanders". During this course both virtual (Diabolo VR) and realistic scenarios are used to present the participant with a variety of leadership challenges. The course was recently taken by senior officers from the Malaysian Fire and Rescue Department, with international fire and rescue veteran Joe Bishop, one of the ground layers of the INSARAG guidelines, as a course director.

For more information, please contact
ICET
International Centre for Emergency Techniques
P.O. box 430
4940 AK RAAMSDONKSVEER,
THE NETHERLANDS
Tel: + 31 (0) 162 51 70 80
Fax: + 31 (0) 162 51 65 60
E-mail: info@savertraining.org
Website: www.icet.nl

THE UNIVERSITY OF NEVADA, RENO FIRE SCIENCE ACADEMY IN CARLIN, NEVADA, USA

Offering one of the finest emergency response programs and training facilities in the world, the University of Nevada, Reno Fire Science Academy (FSA) includes a state-of-the-art training campus in Carlin, Nevada, USA, as well as specialized training programs that can be conducted at the academy or customized and offered anywhere in the world. The FSA's facility and programs are designed to challenge experienced and novice firefighters alike, serving private-sector industries including petrochemical, aviation, mining, technology, transportation and hospitality as well as agencies and governments.

Crisis and Emergency Management

The FSA trains for management of and recovery from crises and emergencies, with focus on incident simulations, command systems, strategies Fand management tactics for crises ranging from natural disasters to man-made emergencies and terrorism.

Courses and consulting include:

- Incident Command and Emergency Response
- Incident Command System (ICS) for Emergency Medical Services (EMS)
- Incident Safety Officer
- Developing and Implementing Table-tops, Drills and Exercises
- Hazardous Materials On-Scene Incident Commander

Hazardous Materials and HAZWOPER

The FSA trains with strenuous exercises using heavy, chemical-protective clothing. Instruction emphasizes protecting people, property and the environment.

Courses and consulting include:

- HAZWOPER 24-Hour/Hazardous Materials First Responder Operations
- Hazardous Materials On-Scene Incident Commander
- HAZWOPER 40-Hour/Hazardous Materials Technician
- HAZWOPER 8-Hour/Hazardous Materials Refresher

Training Centres Round Up

- Hazardous Materials Advanced Response
- Hazardous Materials Chemistry
- Emergency Response Team (ERT) – Comprehensive Refresher Training

Industrial Fire Fighting

The FSA has received worldwide recognition for its industrial curriculum, training props, use of liquid petroleum fuels and its hands-on approach to instruction. FSA has trained firefighters from all 50 states and nearly 40 countries.

Courses and consulting include:

- Entry Level Industrial Firefighter (also available in Spanish)
- Advanced Exterior Industrial Firefighter (also available in Spanish)
- Industrial Fire Brigade Leader (also available in Spanish)
- Industrial Firefighter Refresher
- Emergency Response Team (ERT) – Comprehensive Refresher Training
- Industrial Firefighter Certificate Program (also available in Spanish)

Aircraft Rescue and Fire Fighting (ARFF)

The Fire Science Academy is one of only a few in the world to offer aircraft fire simulation training with liquid petroleum fuel. Intense live-fire rescue simulations create real-world training scenarios enabling responders to achieve superior levels of incident performance.

Courses and consulting include:

- ARFF FAA/CFR 139.319 Annual Live-Fire Refresher (also available in Spanish)
- ARFF 24-Hour Refresher (also available in Spanish)
- ARFF 40-Hour CFR 139 (also available in Spanish)

Rescue Training

The FSA's capabilities in preparing rescuers for a demanding level of performance are second to none. Classroom instruction is reinforced with field practice in safe, realistic and highly challenging environments.

Courses and consulting include:

- Introduction to Trench and Excavation Rescue
- Rope Rescue
- Confined Space Rescue
- Advanced Rescue
- Emergency Response Team (ERT) – Comprehensive Refresher Training

Specialty Courses and Customized Training Programs

The academy's world-class facilities and instructors are available to companies and organizations that require specialized incident-response training, tailored to their particular operations and needs. The FSA can also bring its programs directly to the company or customer.

For more information, please contact:
University of Nevada, Reno
Fire Science Academy
PO Box 877, 100 University Avenue
Carlin, NV 89822 USA
Tel: +1 775 754 6003
Fax: +1 775 754 6575
E-mail: fireacademy@unr.edu
Web: www.fireacademy.unr.edu

TEXAS ENGINEERING EXTENSION SERVICE

World renowned for its hands-on, customized training, the Texas Engineering Extension Service offers a wide range of technical skills training programs aimed at employed workers and those entering the labour force. In 2004, TEEX trained more than 176,000 individuals from all 50 states, six U.S. territories and 46 countries through more than 8,800 classes, which were conducted across the nation and the world.

TEEX is a member of **The Texas A&M University System**, one of the largest and most complex systems of higher education in the United States. Through a statewide network of nine university campuses, seven state agencies and a comprehensive health science centre, the A&M System educates nearly 100,000 students, conducts more than $500 million in research and reaches another 11 million people through service each year.

Whether throughout Texas or across the globe, TEEX can be counted on for the excellent training and technical expertise of its nearly 1,000 employees, many of whom are the top experts in their respective fields. Through contracts and agreements with governments and overseas companies, TEEX provides its unique, specialized training and technical assistance to workers worldwide, ranging from the smallest volunteer fire departments to some of the largest companies in the world.

For more than 80 years, TEEX's goals have included developing businesses and the economy, protecting people and the environment, and building a safe, modern infrastructure. The agency's ongoing efforts have resulted in cleaner drinking water, better roads and infrastructure, improved workplace safety and enhanced public safety through the training of law enforcement officers and firefighters.

Home to the National Emergency Response and Rescue Training Centre, TEEX has been at the forefront of preparing emergency responders to combat terrorist incidents involving weapons of mass destruction prior to the events of 9/11. TEEX also led the initiative to form Texas Task Force 1, both a state and national urban search and rescue team, and established the first swift water rescue strike team. Texas Task Force 1 has been selected by the Federal Emergency Management Agency as one of six teams in the United States to respond to incidents involving weapons of mass destruction.

Mission

The Texas Engineering Extension Service develops a skilled and trained workforce that enhances public safety, security and economic growth of the state and the nation through training, technical assistance and technology transfer.

Vision

The Texas Engineering Extension Service will be recognized as an agency that improves the lives of people by helping provide safe communities, economic opportunity, and an enriched quality of life.

For further information, please contact:
Emergency Services Training Institute
301 Tarrow
College Station
TX 77840-7896, USA
Tel: +1 866 878 8900
Website: www.teex.com/esti

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FSI Cold Plasma Ionization

FSI F-MAP

FSI currently offers amongst the world's broadest range of portable, mobile and fixed emergency hazmat decon shower, and shelter systems and accessories. FSI units range from the economy single first responder type DAT®1010S units to the largest DAT®4099S 5 line 3/4 stage (undress/detergent shower/rinse shower/redress) mass casualty decon shower systems that can decon 10 ambulatory or 10 non-ambulatory personnel or any combination simultaneously.

But FSI is not content with resting on its' laurels as it were. FSI is working hard to meet the increasingly sophisticated demands of the market place – demands that today require fully integrated systems and larger and more personnel handling capabilities.

And one such leading edge product shown represents the very future of decon – that being the **F-MAP cold plasma ionization system.**

Current technology largely employs the use of copious quantities of water and/or detergent or both to decontaminate victims and first responders.

The FSI F-MAP cold plasma ionization system represents the future of Hazmat Decontamination.

The system – currently available in this portable format only – works as follows:

a. inject diluted liquid hydrogen peroxide into the system, thus:

b. creating a hydrogen peroxide mist via the use of a high speed nozzle internally which then:

c. ionizes the mist by accelerating it through a cold plasma arc system of ceramics and metals which release:

d. 'hydroxyls' (the component in misted hydrogen peroxide that actually kills bio/chem. 'nasties') and these:

e. short lived (10's of seconds maximum) 'hydroxyls' are then pushed at high speed thru ducting into:

f. FSI shower/shelter systems where people awaiting decontamination:

g. are misted thus killing on contact even the very worst Vx nerve gas to 5 log (99.999%) and bio. agents to 7 log (99.99999%).*

FSI Three Line 3/4 stage mass casualty DAT®3060S

*For a human to survive Vx nerve gas exposure the 'kill' ratio must be in very short order from the time of exposure to at least 5 logs of 'kill'. To ensure no long term damage the 'kill' ratio must be to 7 logs on Anthrax, Small Pox and other Biological Agents. Lesser Bio. Chem. agents are killed to more than 7 logs. The F-MAP system will work on all known Bio Chem. agents.

DAT®15T 2 line mobile decon shower system

The F-MAP system represents years of work, research, and millions of dollars spent by DOD and the US Army and clearly shows a finished, approved and viable product, available only from FSI in this format.

In the future FSI decon shower systems may well increasingly employ this technology, and eventually water decontamination will become a thing of the past.

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FM Approvals Readi Water-Mis

MORE THAN 10 YEARS in the making, the soon-to-be-released "Approval Standard for Water-Mist Systems" (5560), from FM Approvals, is big, not only in size, but also in its potential impact on an industry that's still in its infancy. Although water-mist fire extinguishing systems have been in use for decades on ships and in other specialized applications, true commercial interest didn't take off until the 1993 ban on halon gas extinguishing agents made water mist a viable alternative.

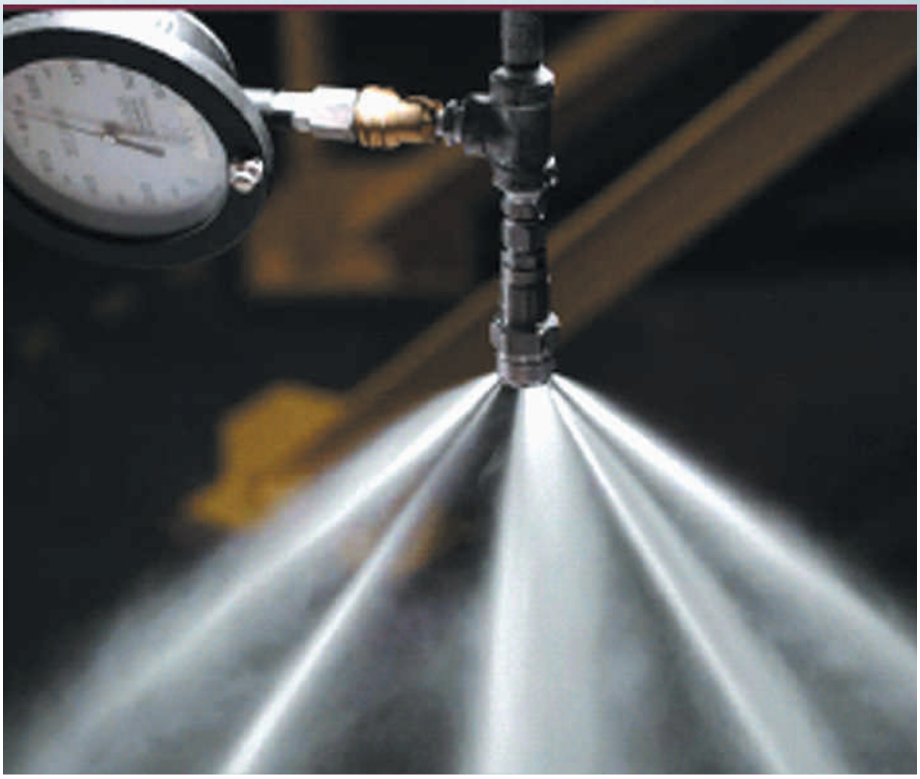
By Kai Foo Chan
Chief Engineering Technical Specialist
FM Global – Global Services, Asia

Why is this standard so extensive? Because water-mist systems are so new and each water-mist system is so unique in its operation and design, approval is limited for now to specific occupancies and applications that have been tested by FM Approvals. For this reason, the new standard must describe fire testing for each of these occupancies and applications, as well as tests for the components that comprise these systems.

WHY WATER MIST?

Water-mist fire protection systems offer some unique benefits that make them particularly well suited for challenging environments. For instance, water-mist systems not only can suppress or extinguish fires, but they also can have a cooling effect within the protected space that makes it easier for firefighters and others to enter and extinguish the fire. Water-mist systems also use far less water than conventional sprinklers, a tremendous advantage where contaminant runoff is a concern or runoff collection is mandated. Other advantages include:

- **Prevents re-ignition.** Because of its cooling effect and room-flooding ability, water-mist systems are very good at preventing re-ignition, even from oil-bath fires and other pool fires.
- **Works well in high-heat-release fires in enclosures when total "flooding" protection is used.** As an enclosure is flooded with water mist, the atomized droplets are drawn to the base of the fire along with room air. The water mist instantly flashes to steam, expanding in volume by about 1,700 fold, replacing the oxygen necessary for combustion.
- **Works in partially ventilated areas.** The system is Approved with the requirement that doors to an enclosure be interlocked to close and ventilation fans be interlocked to shut-off on system discharge. However, unlike CO2 or halon, water mist can work in areas where a door does not close properly and does not pose a health risk like some other gaseous agents.



A water-mist nozzle undergoes "K" factor testing to determine flow characteristics

es All-Encompassing t Standard

- **Smoke-scrubbing qualities.** Some smoke and toxic gases are absorbed by the atomized water spray. The effectiveness cannot be quantified and if smoke removal is needed a properly designed smoke exhaust system should be installed.

> *Approval Standard 5560 from FM Approvals will provide the most comprehensive single source of water-mist test requirements in the world for land-based applications. Manufacturers of water-mist systems and components will be able to quickly find fire and component test requirements.*

WATER-MIST SYSTEM CASE STUDY

At a construction cost of approximately US$1 million per engine test cell, and with 36 cells to be built in the initial development phase, a large automotive group had a lot riding on its new research facility. Fire protection for the heavily instrumented engine test cells was a key concern. With fuels and lubricants flowing through hoses to the engines at high pressure, spray and pool fires were a significant risk.

FM Global engineers reviewed the proposed fire protection plan for the engine test cells and grew concerned that powerful ventilation and large obstructions within the cells would impede the water-mist protection system. Approved water mist systems for enclosure protection require ventilation be interlocked to shut-off when the system activates. The fire protection challenge was further complicated by a large sub-floor space housing ventilation ductwork and mechanical equipment, which had the potential to trap leaking or spilled fluids from the test cells located above the sub-floor.

To evaluate the proposed water-mist system, a full-scale mock-up of the engine test cell was built at the FM Global Research Campus in the USA. The research team developed a test programme to determine whether potential fires could be extinguished or controlled by the proposed water-mist system.

The proposed water-mist design specified that nozzles, equipped with glass bulb thermal-link triggers, should be located on the cell ceiling and inside the engine ventilation ducts. Diesel and room temperature n-heptane were used to simulate heated lubrication oil and gasoline.

Two types of detection/trigger mechanisms also were tested – UV/IR detectors and glass-bulb links. Through this evaluation, it was determined that the original layout of nozzles, located only at the ceiling and in the engine ventilation ducts, could not extinguish a 1m^2 n-heptane pool fire, partially shielded below the engine mock-up or located below the ceiling ventilation opening. (Note: Pool fires with n-heptane and diesel located in other areas of the test cell could be extinguished with the original layout of nozzles.)

To provide adequate protection, two additional water-mist deluge nozzles were added to the sidewalls of the engine test cell, and linked to two UV/IR detectors located diagonally apart in the upper ceiling corners. Two additional ceiling nozzles also were added to address certain vulnerable areas. The original glass-bulb link nozzles located in the sub-floor area were tested and found to provide adequate protection without modification. Since the completion of this research, the company has built 36 engine test cells at its new research facility, using the FM Approvals tested water-mist protection system.

SETTING THE STANDARD

Approval Standard 5560 from FM Approvals will provide the most comprehensive single source of water-mist test requirements in the world for land-based applications. Manufacturers of water-mist systems and components will be able to quickly find fire and component test requirements. This will save both time and money by reducing errors and helping manufacturers to more accurately anticipate the test program required for approval.

Following review, the final standard will be released in late summer or early autumn. FM Approvals hope the new approval standard is adopted or used as a springboard for international water-mist standards for land based applications.

ABE CHINESE PARTNERSHIP

The **Association of Building Engineers** is proud to announce its partnership with Flaming 21 Ltd, Hong Kong, and Guangzhou University in the People's Republic of China in the accreditation of top-up degrees delivered at the University. David Gibson, Chief Executive, Chris Dawson, President and Arwel Griffith, Immediate Past-President travelled to China in March and met with representatives of Flaming 21 Ltd and the University to ratify the proposals.

The Association, working with Flaming 21 Limited, a training provider based in Hong Kong, formalised the training programme for the delivery, monitoring and accreditation of post-graduate diplomas in construction management and contract administration.

The postgraduate diploma combines a mixture of assessed work, formal examination and interviews. Candidates successful in the process, may progress to membership of the Association of Building Engineers. Candidates seeking to participate in the programme are required to have a university degree in a construction-related subject, be professionally qualified as a registered engineer and have a minimum of three years' relevant work experience.

A very well received positive development reinforcing the activities of the Association and its global involvement.

For more information, please contact:
Association of Building Engineers
Tel: +44 1604 404121
Email: building.engineers@abe.org.uk

GROUPE LEADER INTRODUCES THE VIBRAPHONE®ASB-8 AND THE VIBRASCOPE®BVA-6, TWO EFFICIENT EQUIPMENTS FOR SEARCH OPERATIONS!

Basically, the Vibraphone®ASB-8, electronic listening equipment, is known to rescue teams throughout the world, and enables people buried under rubble as a result of catastrophes to be located. The exceptional sensitivity of the Vibraphone®ASB8 enables it to pick up the slightest sound made by disaster victims. It is also fitted with an adjustable filter, which deadens the effect of dull noises like pneumatic drills, passing vehicles etc.

A team of three people is necessary for the use of Vibraphone®ASB-8: an operator, who listens thanks to a helmet, and the placing of two seismic microphones by his two team-mates. He co-ordinates positioning thus and listens to the sounds perceived by each of the two microphones. According to the perceived sounds, he indicates to his team-members the placement that is as near as possible to the victim, until locating him except for the meter.

The Vibrascope®BVA-6 enables disaster rubble to be searched and for victims to be contacted via a microphone incorporated in the camera. It comprises a telescopic pole at the end, which is an infrared camera, which can rotate 360 degrees, together with a portable screen monitor. This equipment makes it possible to explore the debris and to speak to a possible victim via a microphone incorporated in the pole.

For example, at the time of an earthquake, a person is buried, he manages to emit sounds but nobody succeeds to locate it. The team equipped with a Vibrascope®BVA-6, works in binomial: The coordinator, who has the audio and video return of the pole, indicates to his team mate if he may advance or move back so as to position the pole until locating as best as possible the victim. Once located, it is then possible to communicate with him, to know if he is wounded, to reassure him until the rescues succeed in releasing him from the debris.

The range of uses for the Vibrascope®BVA6 vary from rescuing buried victims to surveillance and maintenance techniques for customs examinations, even archaeological investigations. . .

For further information, please contact:
Groupe Leader
Tel: +33 235 53 05 75
Email: export@groupe-leader.fr

AMKUS RESCUE SYSTEMS

AMKUS Rescue Systems is proud to introduce their NEW ROPE RESCUE SYSTEM. The advanced design deploys in under two minutes, eliminating pulley systems and load-releasing hitches while greatly reducing the number of rescuers needed topside from 8-10 to just two! It is easy to use, requiring less training than traditional rope rescue methods thanks to the incredibly simple design. Unlike other belaying devices, THE AMKUS ROPE RESCUE SYSTEM passes knots with ease.

The AMKUS ROPE RESCUE SYSTEM is designed to improve the safety of both rescuer and victim in dangerous high angle rescue operations with a 1,000 lb. working capacity with a 10:1 safety margin and an instant stop/zero shock loading system. It features a precise control, which allows the load to be raised or lowered by a fraction of an inch at a time for critical positioning. It also creates a more organized incident scene with fewer elements to contend with and fewer technicians to coordinate.

AMKUS also manufactures a complete line of high performance hydraulic rescue tools and extrication equipment including: spreaders, cutters, combination tools, rams and power units.

For more information, please contact:
AMKUS Rescue Systems
Email: experts@amkus.com
Website: www.amkus.com

ELKHART BRASS – OVER A CENTURY OF INNOVATION

Elkhart Brass Mfg. Co, Elkhart, Indiana, USA, is the industry's most experienced manufacturer of fire fighting and fire protection equipment. Known worldwide for its commitment to quality, safety and customer service, Elkhart Brass celebrated its 100th anniversary in 2002. Intent on expanding its worldwide distribution network, Dominick Monico, Vice President of Strategic Business Development, heads the company's international operations.

Throughout its history, Elkhart Brass has led the industry in the development of products that have changed the face of firefighting. Among the many industry firsts introduced by Elkhart Brass are:

- The ball shut-off nozzle
- The peripheral jet fog Mystery® Nozzle
- Constant flow, selectable gallonage Select-O-Flow® Nozzles
- Select-O-Matic® Nozzles that operate automatically on availability of water rather than on pressure

The company's most recent development is the industry's first W.E.T. (Wireless Electronic Technology) for radio remote controlled operation of monitors from up to ¼ mile away. Elkhart Brass is committed to embracing new technology that will continue to expand its product range and worldwide market area.

Elkhart Brass manufactures over 2,000 products, many of which bear internationally recognized safety certifications such as CE, UL and FM. Every piece of equipment is tested for performance and compliance to high quality standards. The company is ISO 9001 Certified. Fully integrated processes, including operation of its own foundry, allow Elkhart Brass to satisfy today's quality demands while providing its customers with the utmost flexibility.

Now in its 4th generation of family management and ownership, Elkhart Brass continues to combine the reliability of its successful past and solid high-performance products with top new people and cutting edge technology to meet the changing needs of the fire fighting and fire protection industries. The company looks forward to a future built upon technology-driven products such as multiple monitor systems and advanced water delivery systems for servicing a broad range of market applications including apparatus manufacturers, municipalities, marine, refineries and general industry.

For further information, please contact:
Elkhart Brass Mfg. Co
Tel: +1 574 295 8330
Website: www.elkhartbrass.com

NEW VEHICLE DECONTAMINATION SYSTEM

Hughes Decon Systems is working in collaboration with military authorities in Europe to develop a fast response vehicle decontamination system. A prototype unit has already been delivered and is undergoing evaluation trials. A production models is expected to be in service by the end of the year and the system will then be available to other military authorities and civil emergency services worldwide.

Effective vehicle decontamination is essential in a modern theatre of operations to ensure that the full range of fighting and logistical support equipment is always available to military units. The same principle applies to equipment used by units engaged in counter terrorist activities and in an emergency response role.

Civilian emergency services also depend on the availability of vehicles and specialist equipment. Increasing demands on their time and resources means that contaminated vehicles need to be back in service as quickly as possible.

The new system addresses the specific concerns expressed by the military, vital issues that are equally relevant to civilian authorities.

A fast response is critical in dealing with any decontamination incident especially where personnel may be involved. This requires a unit that can be easily transported to the scene of an incident. It must be compact, robust and easy to operate; and all this must be achieved without compromising performance.

The unit has evolved from the Hughes high pressure cleaner. It incorporates a high-pressure chemical injection system and spray gun to quickly neutralize and remove contamination from vehicles. Mounted on a three-wheeled chassis the unit can be easily moved into position then immobilised using a brake on the front wheel. It is totally self-contained. The boiler can be powered by kerosene or diesel and the pressure pumps are driven by a slow revving electric motor. A low-level fuel cut-out is included with anti-leak detection and auto time delay shut down at zero pressure which can reduce maintenance costs by 75% while protecting the user.

The vehicle decontamination unit has been designed to compliment other systems within the Hughes range, including portable shelters for decontaminating emergency service personnel and members of the public as well as systems for treating personal protective equipment.

For further information, please contact:
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FIND YOUR WAY INTO ANY RESCUE SCENE

TNT Rescue Systems, Inc., one of the industry leaders in innovative extrication products, is proud to announce the addition of a new tool to their growing product line – the Forcible Entry Tool, new in 2005. The TNT Forcible Entry Tool reduces the number of pinch points through its superior design. This TNT tool allows for quick operation with the included hand pump. The design of this new tool makes for manageable handling and a secure grip.

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REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

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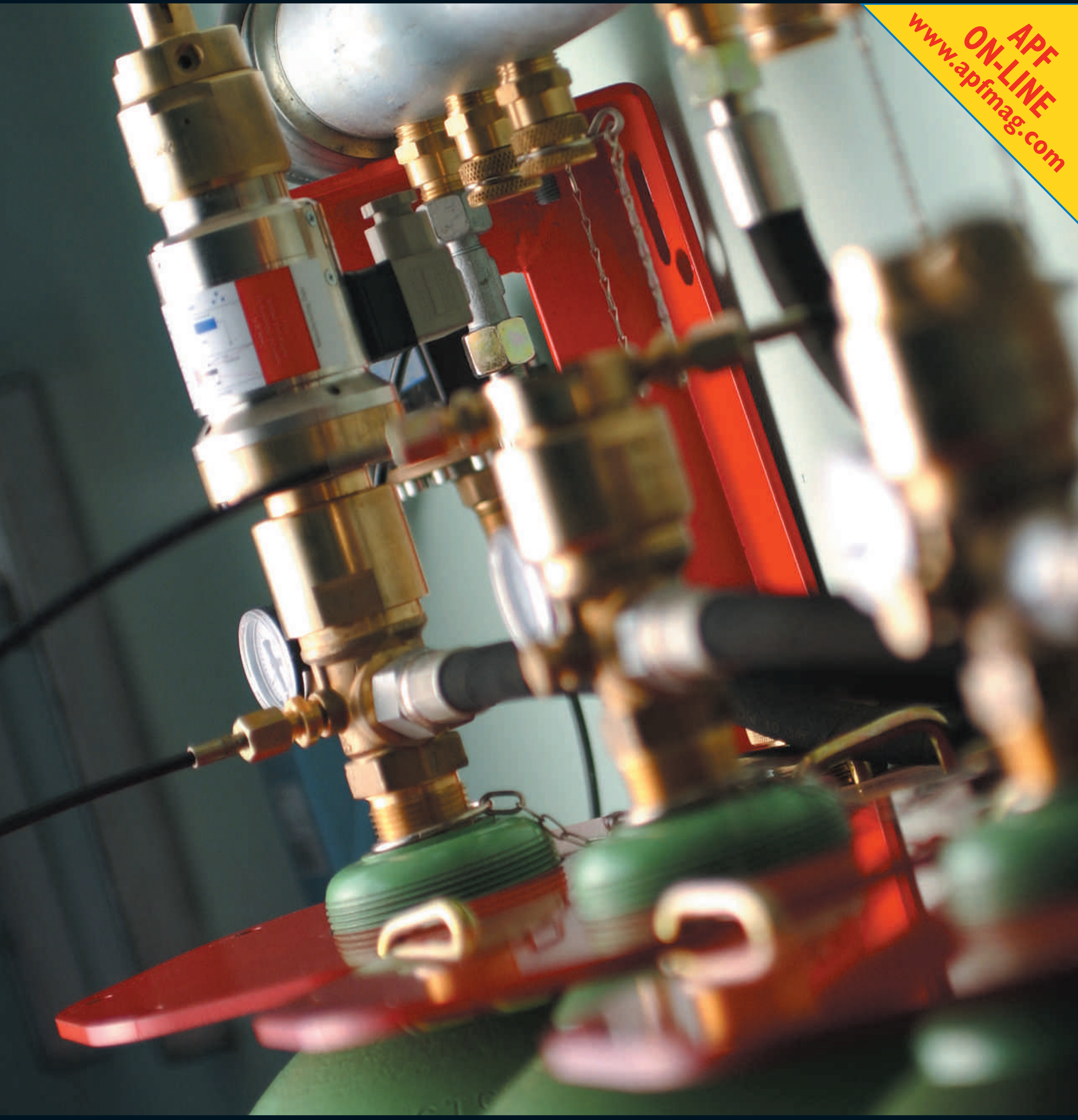

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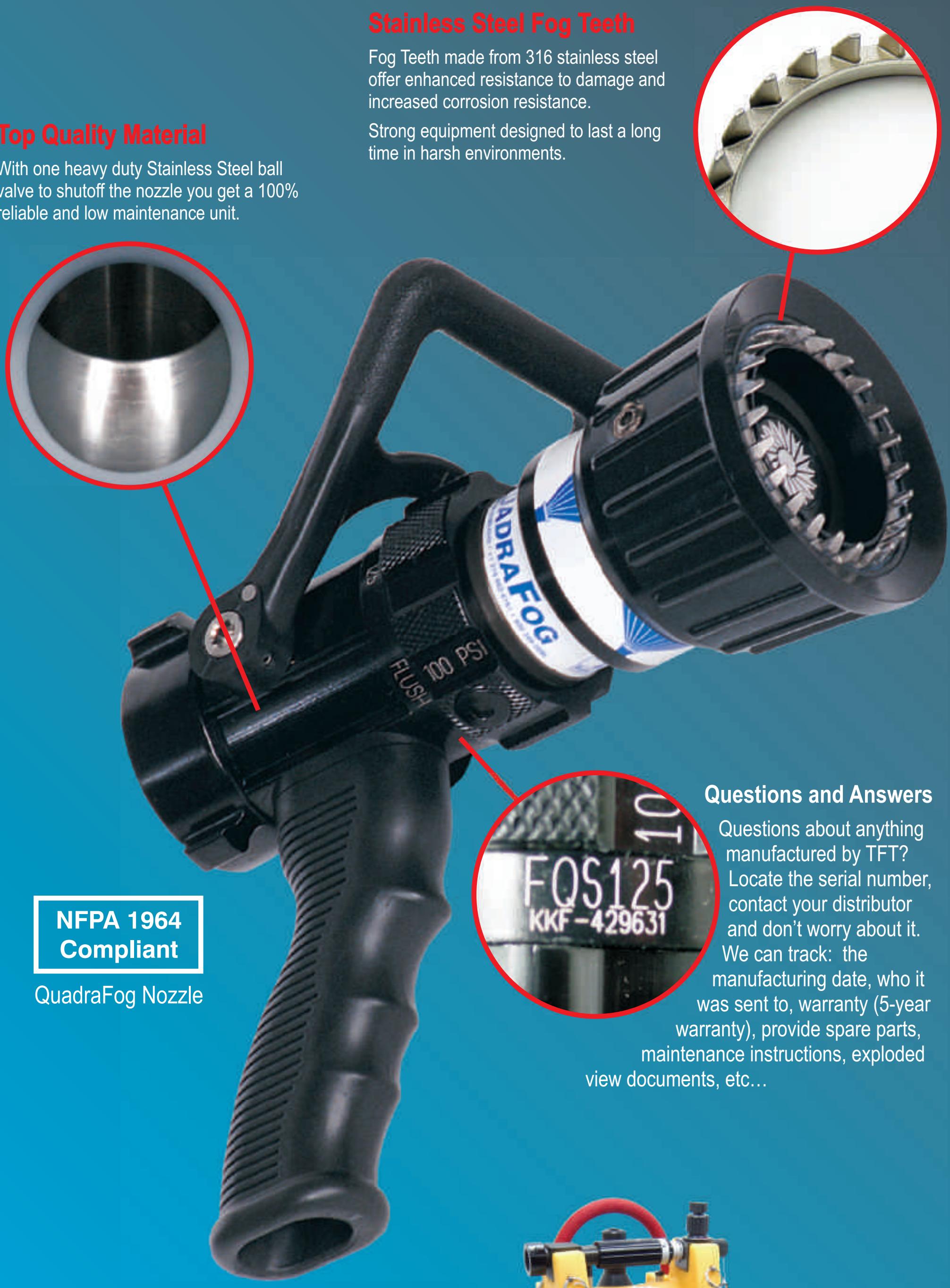

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Questions about anything manufactured by TFT? Locate the serial number, contact your distributor and don't worry about it. We can track: the manufacturing date, who it was sent to, warranty (5-year warranty), provide spare parts, maintenance instructions, exploded view documents, etc…

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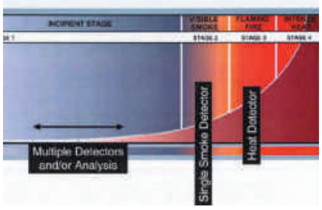

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FOREWORD

by Jeff Godfredson

NFPA's Asia-Pacific Operations Director

Codes and Standards

I am quite often asked about the creation of codes and standards and there are a number of misconceptions. Many people assume that our documents are created by NFPA staff; this is not correct. The documents are created by a specific process involving nearly 7000 volunteer experts who participate in the NFPA process. NFPA's role is to provide the administrative support to ensure the process in followed.

To their own knowledge the experts also have access to all comments and recommendations from interested members of the community. To help facilitate this process there is a copy of a comment form in the back of every code and also on our website. We welcome comments from all interested parties from all around the world. You do not need to be a NFPA member to submit comments.

The Committees also have access to information on actual events (e.g. Station Night Club Fire which killed 100 people) to be able to incorporate the lessons learnt. They also have access to scientific research as it becomes available.

(for those interested in more detail on the formal process and safeguards to prevent bias should visit the NFPA website (www.nfpa.org) and click on Codes and Standards)

Many people who use the Codes and Standards do not understand that these outline minimum requirements to achieve the objectives of the documents. Some see the requirements as the maximum they have to do to achieve the documentation required to occupy the building. It may be the case that this does not fully meet the Risk Management requirements of the occupier.

Of even more concern is when developers/builders construct using less than the requirements of the code (minimums) and use terms such as "generally complies with the requirements of the NFPA Code" It either complies or it doesn't. If key elements such as required sprinklers are removed because of cost or other reasons the building/structure and the people who use it are at great risk.

In such circumstances those who create these problems should be held accountable for the problems they cause particularly if it results in injury or death.

Jeff Godfredson
NFPA's Asia-Pacific Operations Director

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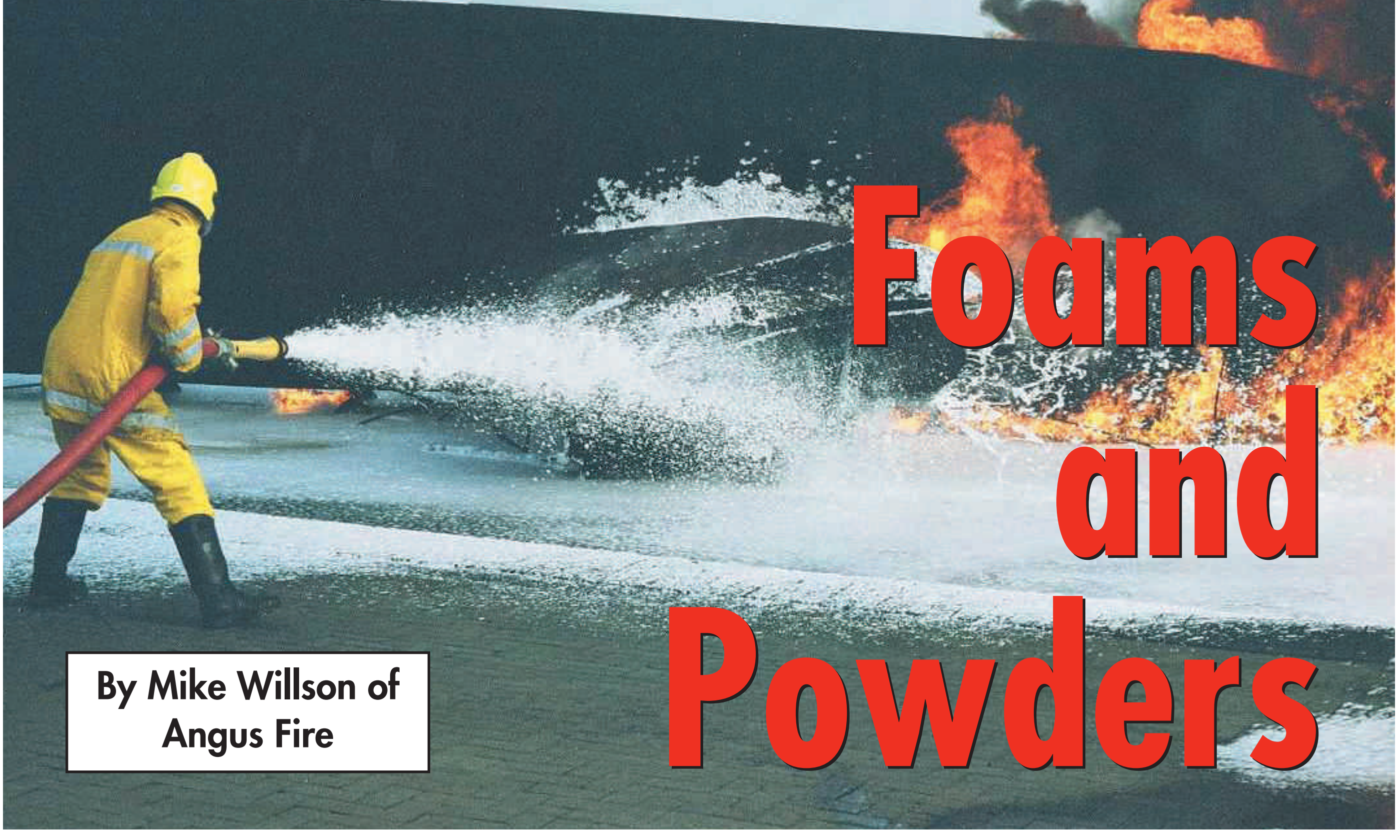
Foams and Powders

By Mike Willson of Angus Fire



Aircraft Fire Fighting – Pic courtesy of Angus Fire

Selecting the Right Ones for your Application

THERE ARE MANY DIFFERENT types of foam and powder on the market, so how do you choose the right one for your application? Here Mike Willson of Angus Fire focuses on the wide range of applications where foam and powder are used, and discusses the most appropriate types to use in each case.

STORAGE TANKS

Bulk hydrocarbon storage tank fires are among the most difficult hazards that fire fighters face. There is no doubt that fixed foam protection systems are the most effective solution for this application, whether rimseal foam systems on floating roof tanks, or top pourer sets and base injection systems on cone roof and internal floating roof tanks. Foam is also applied "over the top" from ground-based monitors.

The choice of foam is critical for not only extinguishing the fire, but also preventing dangerous flashbacks and re-ignition. The key performance criteria required are resistance to intense heat, the ability to seal against hot metal tank shells, tolerance to being mixed vigorously with the burning fuel, and a stable foam blanket to cool the deep layers of hot fuel.

The foam of choice by most of the world's oil companies is a high quality FluoroProtein (FP) type foam type like Tankmaster or FP70. These are specially formulated for storage tank fires and have proven highly effective at many incidents. They have a protein-based "skeletal" structure inside the bubble wall that provides exceptional resistance to heat, and the combination of natural protein and fluorochemicals is highly resistant to mixing with hydrocarbons. The other main types of foam used in this application which have also been shown to be highly effective over many years are Alcohol Resistant Aqueous Film-Forming Foams (AR-AFFF) such as ATC and Alcohol Resistant Film-Forming FluoroProteins (AR-FFFP) such as Alcoseal.

Independent test data is crucial in making the right choice of foam and should always be included in purchasing specifications. Underwriters Laboratories Inc. (UL) is a not-for-profit organisation that is highly experienced in fire testing foams to its UL162 Standard. Foams are

Process Area Protected by AR-FFFP Foam – Pic courtesy of Angus Fire

Aircraft Hanger – Pic courtesy of Angus Fire

subjected to a rigorous set of extinguishing, proportioning and quality tests through proprietary equipment. It does not rely on a single certificated performance through a specialist test branchpipe like some other fire tests. It also operates a unique Follow-up Service to police the foam formulations of products that pass. There is an on-going focus on batch to batch quality and consistency of products under UL that is not provided by any other independent test standard.

Another important independent test is LASTFIRE. Developed by sixteen of the world's leading oil companies, it is specifically designed to simulate large storage tank fires and assess the relative efficiencies of different foams. It uses three different applicators, namely a semi-aspirated "big gun" type nozzle, an aspirated foam cannon type nozzle, and a system pourer nozzle. Tests have shown that a well aspirated blanket of FP or AR foam generated with a foam cannon is capable of providing controlled extinction and good post-fire security at lower application rates than the semi-aspirated nozzle, where forceful plunging and turbulence at the impact point requires higher application rates.

The foams that perform best in the LASTFIRE test are high performance FPs and those AR-AFFFs with high levels of polymer to offset the fast-draining characteristics inherent in standard AFFF. However, there are substantial differences between individual brands. Some AR-AFFFs fail some of the tests, usually through flare-ups in the edge-sealing tests or flashovers during the burnback test. It is noticeable that such flare-ups and flashovers tend not to occur with natural protein based foams. This is because their detergent-free formulation resists the entrainment of fuel in the foam blanket.

Virtually all AFFF type foams have failed the LASTFIRE test. This is because they do not have the stability, heat resistance and burnback properties that are required on tank fires. It is also well established that aqueous films do not form on hydrocarbon fuels above 70 to 90°C, and surface fuel temperatures in storage tank fires can exceed 250°C.

PROCESS AREAS

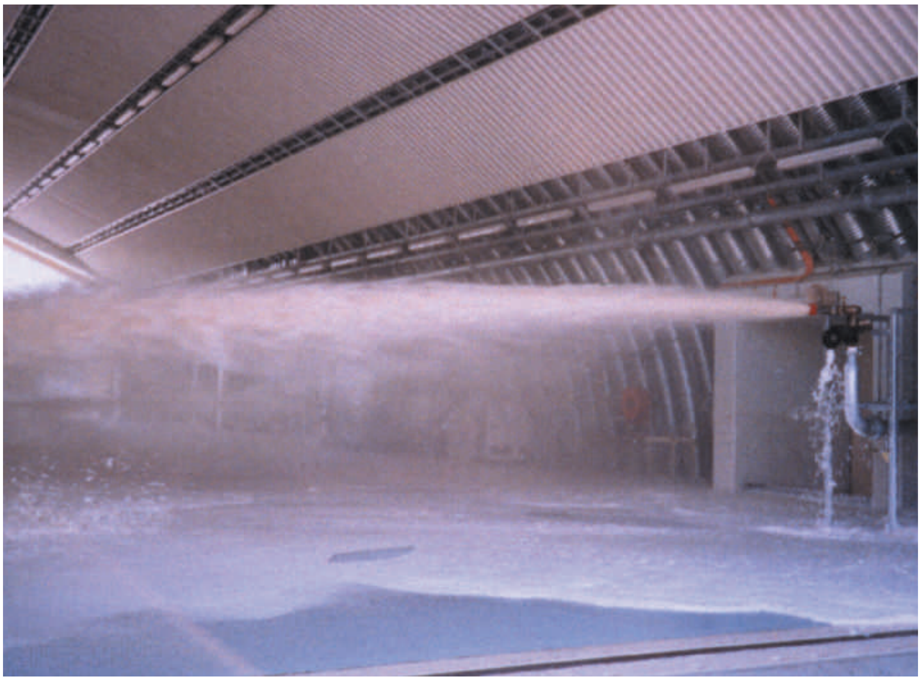
If process areas contain hydrocarbon hazards only then foam deluge systems using Film-Forming Fluoroprotein (FFFP) or AFFF are appropriate and widely used through non-aspirating deluge nozzles.

Where a "mixed risk" of hydrocarbon and polar solvent hazards exists then only Alcohol Resistant type foams should be used, either AR-FFFP or AR-AFFF. Polar solvent hazards are foam destructive and so standard foams are ineffective. Both AR types of foam are frequently used through foam enhanced sprinkler systems. The foam solution aspirates as it splashes off plant, storage vessels, pipe work and the floor to generate a thin blanket to smother the fire.

Many leading chemical companies use a zoned foam deluge system based on K40 aspirating foam/water sprinklers. These deliver a good quality aspirated foam blanket to give fast and effective extinguishing with excellent post-fire security. If left operating, the initial foam supply normally runs out after ten minutes. The system can continue operating with water only to cool structural steelwork and vessels in the area and help prevent catastrophic failure that may arise from any remaining small pockets of fire.

Most AR-AFFF and AR-FFFP products contain a water-soluble polymer additive. The foam that first comes into contact with the polar solvent is destroyed, but leaves the polymer behind as a physical barrier on the fuel surface. This polymer separates the foam from the fuel and enables a foam blanket to build up and extinguish the fire. The polymer additive makes these foams more viscous, so they need extra energy to get them moving in pipes. This can make accurate and consistent proportioning more difficult in low flow conditions when the first sprinkler heads open.

Polymer-free AR foams are less



Aircraft Hanger – Pic courtesy of Angus Fire

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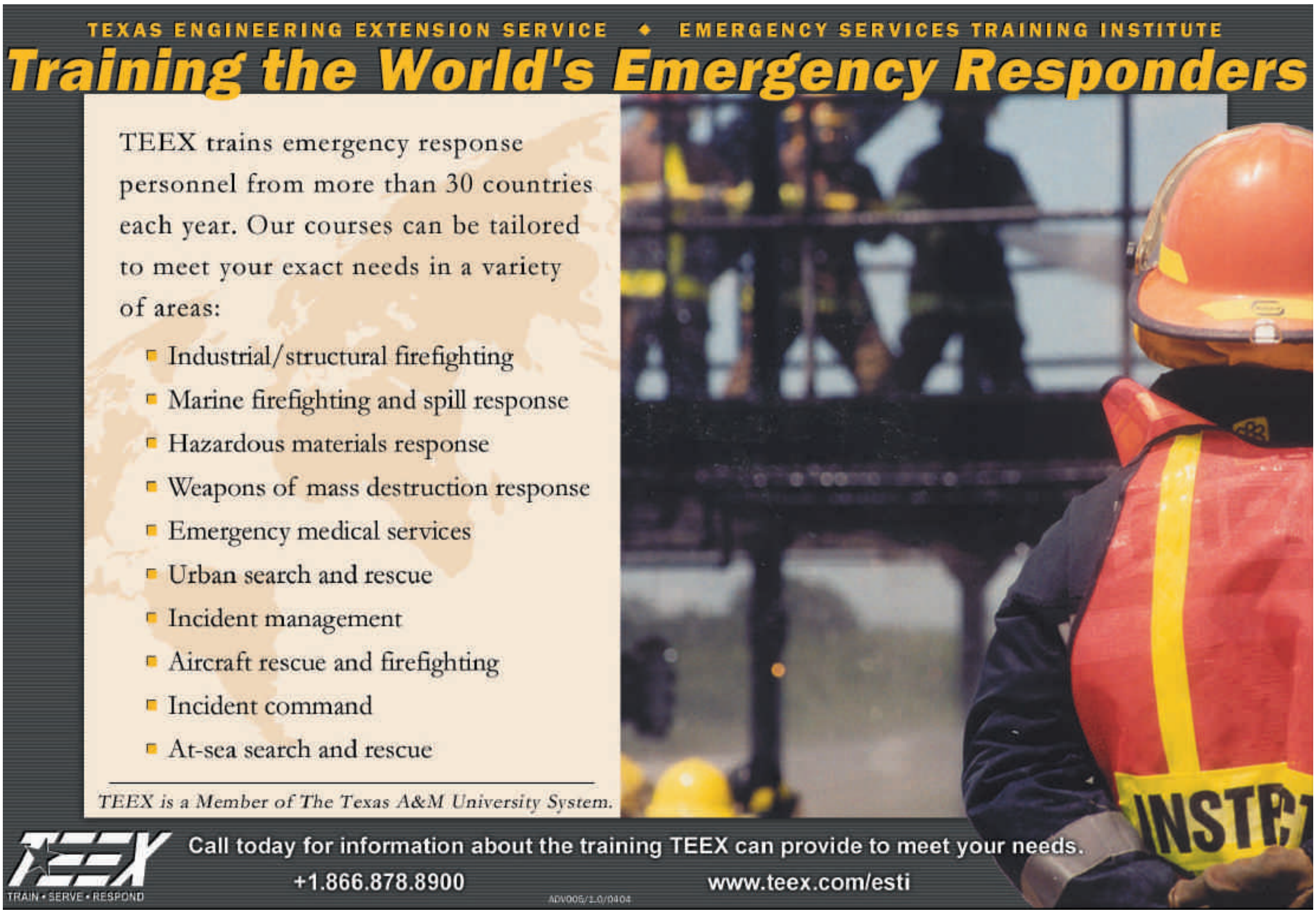

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viscous and easier to use. The polymer-free versions of AR-FFFP are well proven in process areas and offer important benefits in flowing more easily and therefore being easier to proportion under low flow conditions. The latest AR-FFFP Niagara can control and extinguish polar solvent fires quickly and effectively and it flows easily through pipe work, even at temperatures at which conventional polymer-based products are frozen solid.

For pressure fed fires in congested process areas, high performance powders are often used with film-forming foams through dual agent units to provide rapid knockdown as well as post-fire security.

Tanker Loading Bay – Pic courtesy of Angus Fire

WAREHOUSES

Warehouses increasingly contain polar solvent risks. For example, many DIY stores contain polar solvent hazards such as solvent-based paints and windscreen washer additives. Many manufacturing plants also have warehouses that contain polar solvent risks. Recent fire losses in flammable liquid warehousing protected by conventional closed-head sprinkler systems have proven that water alone cannot be relied on to provide adequate fire protection. Moreover, the huge volumes of water run-off from such systems can wash hazardous materials into the environment.

Foam-water sprinkler systems that apply AR-FFFP or AR-AFFF are ideal for warehouses that store a variety of flammable liquids. Wide-range Accurate Sprinkler Proportioners (WASP) are now available as “plug-in” pre-engineered systems to provide accurate foam induction regardless of how many sprinkler heads discharge during a fire.

High Expansion foam is sometimes used in warehouses. The gentle application and stable bubbles produced at expansion ratios of around 500:1 can smother the fire and quickly fill large volumes with foam.

LOADING RACKS

Aspirating foam/water discharge nozzles are ideal for road and rail tanker loading bays. High level nozzles are mounted overhead to protect the top and sides of the tanker, secure the likely pool fire developing in the surrounding area, and provide cooling to the tanker. Low level nozzles are designed to throw foam underneath the vehicle and protect the tyres. Such systems should be used with high quality FP or FFFP on hydrocarbons, and AR-FFFP or AR-AFFF on mixed risks.

AIRCRAFT HANGARS

Fire protection for aircraft hangars, whether civil or military, has traditionally been based on foam-water deluge systems incorporating sprinkler heads such as the K40 supplemented by low-level oscillating foam monitors for under-wing protection. In recent years, however, operators have been moving away from overhead sprinkler systems in favour of oscillating monitors mounted not only at low-level for under-wing protection, but also at high level for over-wing protection. These are used mostly with FFFP or AFFF foams since the risk is predominantly hydrocarbon. Since most hangar fires occur at floor-level, it takes less time for foam to reach such fires from floor-mounted monitors than from sprinklers mounted on high ceilings. Monitors sweeping automatically through pre-set arcs of oscillation can cover vast areas of hangar floor space with foam within seconds of actuation and also ensure a more penetrating delivery of foam.

Supplementary high expansion type foam systems using Synthetic Detergent (SD) as the foaming agent are also used for local application. The foam generators are located in the ceiling or exterior walls so that only air from outside the

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OFFSHORE RIGS

Low expansion foam is generally applied to helicopter landing areas on offshore installations in either aspirated or non-aspirated form. While solution applied non-aspirated provides fast knockdown, aspirated foam gives enhanced protection after extinguishment. Foam monitors are used to apply foam over the whole of the landing area irrespective of the wind direction. Film-forming foams like FFFP and AFFF are most commonly used, with a 1% AFFF having the added advantage over 3% grades of saving weight and space. It is important to ensure the foam chosen has an independent test certificate to ICAO Level B.

BUND PROTECTION

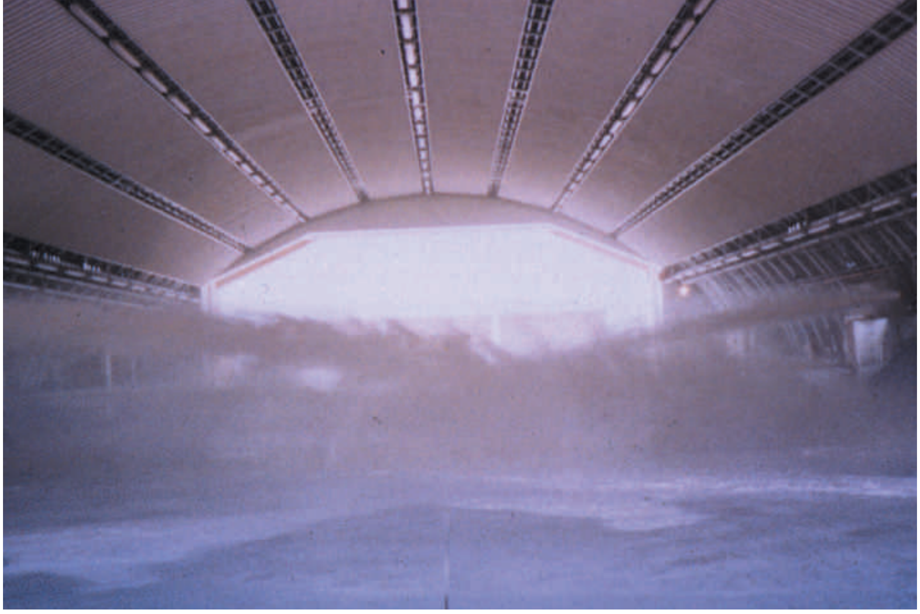
Many large storage tank fires either originate or escalate in the bunded or diked region surrounding a tank. Unignited fuel spreading quickly in the bund area from leaking valves, flanges, cracked pipes, tank overfilling, boilovers, and even routine maintenance have contributed to some of the world's largest tank fires. There is no better foam for this application than a high performance FluoroProtein (FP). More expensive alternatives are AR-AFFF and AR-FFFP. Using these foams at medium expansion ratios of 30-50:1 is extremely effective. It minimises the risk of burning product splashing into adjacent areas, and also covers and cools pipework, valves and flanges.

AIRPORTS

Aircraft crashes usually involve shallow spill fires that burn for a few minutes. Foam must provide fast knockdown of the flames to gain rapid extinction, and good post-fire security to prevent sudden re-ignition during rescue operations.

Historically, AFFF was the foam of choice for aviation. It addressed the speed of knockdown effectively, being specially formulated to drain quickly and release an aqueous film that quickly spreads ahead of the foam blanket. However, its detergent ingredient led to problems with post-fire security. In the 1980s, the new Film-Forming Fluror-Proteins (FFFP) provided the same film-forming speed of extinction, but with superior post fire security. It also offers much better environmental performance. Many airports around the world have now upgraded from AFFF to the latest FFFP technology.

It is important to ensure the foam



Aircraft Hanger – Pic courtesy of Angus Fire

Fire – Always prepared for every situation

We offer a complete range of high performance and environmentally friendly foam liquids to the fire professional e.g.

Alcohol resistant Universal AFFF foam liquids	MOUSSOL – APS LV MOUSSOL – APS 3% MOUSSOL – APS f-15
Aqueous film forming foam liquids	STHAMEX – AFFF 1%, 3%, 6%
Synthetic foam liquids	STHAMEX f-6, f-15, f-20, f-25
Protein foam liquids	FOAMOUSSE 3%, 6%
Fluor Protein foam liquid	FLUOR FOAMOUSSE 3%, 6%
Training foams	

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Medium Expansion Foam for Bund Protection – Pic courtesy of Angus Fire

chosen has an independent test certificate to ICAO Level B. For small and lower category landing areas, ICAO Level A may be acceptable. But beware of some of the Fluorine Free Foams (F3) that are on the market. These are still not up to the mark. Some manufacturers claim to meet ICAO Level B by using high levels of polymer. However, several airport authorities have tested these products and found them to be inferior to the regular ICAO Level B grade FFFP and AFFF products. Not only are they typically 20% slower to extinguish, but they also offer poor levels of post-fire security and greater toxicity to organisms in the water environment.

More gentle F3 mimic training foams are available for use with non-emergency vehicle calibration and personnel training if there are environmental restrictions. It is also worth noting that FluoroSurfactant Free Foams (FSFF) are merely AFFFs under a different name. They contain similar levels of fluorine from fluoropolymers (rather than fluorocarbon surfactants) as conventional AFFFs, and yet struggle to match their performance.

SHIPS AND TANKERS

Fires in ship engine rooms and machinery spaces are notoriously difficult to extinguish. From oil tankers to cruise liners, the problem is not only intense heat and dense smoke, but also the inaccessible nature of vessel construction. Fire fighters often cannot reach the source of the fire to even attempt extinguishment, and so the installation of fixed fire protection systems is vital.

The majority of systems currently in use are gaseous suppression systems. However, specialist marine foam systems are also used to completely fill engine room and machinery spaces with high expansion foam such as Expandol in only a few minutes. The foam acts as a vehicle to carry extinguishing water around obstacles and deliver it to the seat of the fire. It searches out fires in restricted areas, cools structural steel work, and prevents re-ignition.

CLASS A

There are also some specialised foam products developed principally for Class A hazards involving carbonaceous materials. These are mostly used for forestry fire fighting and protecting timber-based housing by municipal fire departments in the USA, Canada and Scandinavia. These are generally unsuitable for use on Class B hazards, at least nothing more than the smallest fuel spillage from something like a small chain saw.

POWDERS

Dry chemical powders are used in many of the applications already discussed. A wide range are available, suitable for both small-scale portable use and in large fixed installations.

Powders specific for BC class fires in high risk areas such as refineries, chemical plant and airfields, include potassium bicarbonate, often known as Purple K, and the quite different potassium allophanate or Monnex. Potassium allophanate is a special potassium bicarbonate and urea complex which gives additional performance benefits over other powders. These special powder particles shatter as they enter the heat of the fire, dramatically increasing the surface area for quenching free radicals generated in the fire's chemical reaction, so it is extinguished 3 to 5 times faster than other powders with typically only ⅓ to ⅕ as much powder used for a given size fire. In professional hands, just 1kg of Monnex can extinguish a $4.52m^2$ area 144B gasoline tray fire, which no other powder can! It also helps to compensate for poor technique so aiding less experienced fire fighters and giving them the best chance of success. BC type powders are focussed in the area of flammable liquid protection and are well suited to all hydrocarbons, polar solvents and flammable gases including LPG, LNG and hydrogen. They are used primarily for the first strike when a fire is small or where 3D or pressure-fed fires need to be extinguished. They are also safe for use where an added electrical hazard is likely to be involved.

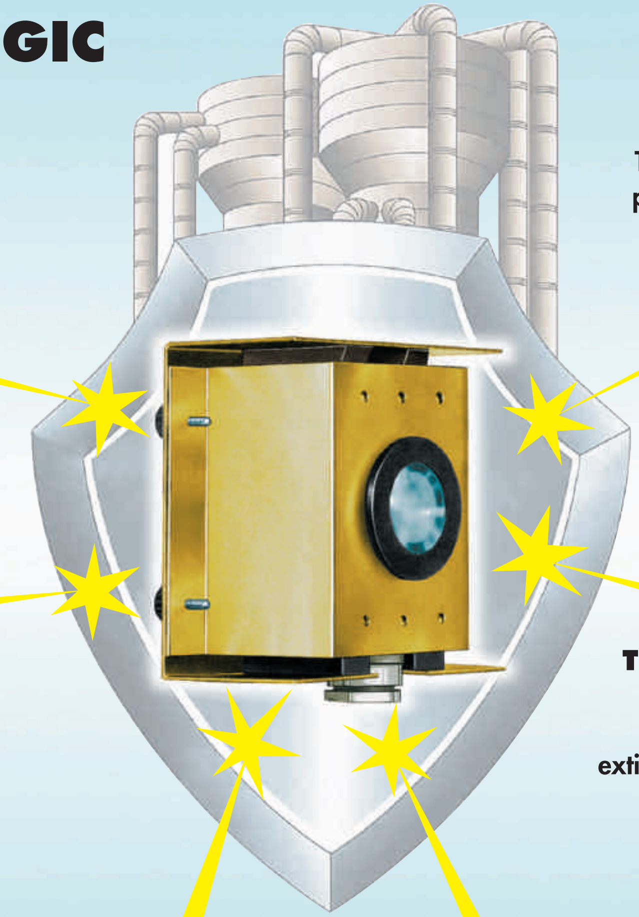
Multi-purpose or ABC powders are best suited to carbonaceous materials and added electrical hazards. These are based on mono ammonium phosphate (MAP) and produce a crust on Class A materials which help to extinguish them and give some limited levels of resistance to re-ignition.

Powder type	High performance BCE powder (especially gases and pressurised liquid fires)				
Foam Type	FP	AFFF	FFFP	AR-AFFF	AR-FFFP
Fuel type	HC only	HC only	HC only	HC & PS	HC & PS
Fire type	Tanks & Bunds	Shallow spills	Shallow Spills	Multi-purpose	Multi-purpose
Fire Knockdown	***	****	****	***	***(*)
Heat & flame resistance	****	**	***	***	****
Post-fire security/burnback	****	**	***	***	****
Fuel Tolerance	****	**	***	***	****

The more * the better! HC = Hydrocarbons PS = Polar Solvents

CONTROL LOGIC Spark detector

designed for
dust collection
systems
to protect
storage silos
from the risk
of fire.



Sparks fly at high speed.

They travel at a hundred kilometres
per hour along the ducts of the dust
collection system and reach the silo
in less than three seconds

The CONTROL LOGIC
SPARK DETECTOR
is faster than
the sparks themselves.
It detects them with its highly
sensitive infrared sensor,
intercepts and extinguishes
them in a flash.
It needs no periodic inspection.

The CONTROL LOGIC system
is designed for "total supervision".
It verifies that sparks have been
extinguished, gives prompt warning of
any malfunction and, if needed,
cuts off the duct and stops the fan.

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BETTER *TO KNOW* IT BEFORE

Eye is faster than nose.
In the event of live fire
the IR FLAME DETECTOR
responds immediately

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the fastest and most effective fire alarm device
for industrial applications

IR FLAME DETECTOR
RIV-601/FA
EXPLOSIONPROOF
ENCLOSURE

For industrial applications indoors
or outdoors where is a risk of explosion
and where the explosionproof
protection is required.
One detector can monitor a vast area
and responds immediately
to the fire, yet of small size.

Also for
RS485 two-wire serial line

IR FLAME DETECTOR
RIV-601/F
WATERTIGHT
IP 65 ENCLOSURE

For industrial applications indoors
or outdoors where fire can spread
out rapidly due to the presence of
highly inflammable materials,
and where vast premises need an optical
detector with a great sensitivity
and large field of view.

ISO 9001

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rescue equipment

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Holmatro® CORE™ Technology

This changes everything!

CORE™ Technology - one of the most important extrication equipment innovations ever!

single hose system: high-pressure hose inside low-pressure return hose

- Changing of tools under flow: anytime, anywhere, no releasing of pressure at the pump!
- Protected power: user is never exposed to more than 25 bar
- Fewer couplers and dust caps: fewer connections
- Flexible Kevlar reinforcements (no steel): easy handling, no kinking
- Free 360° rotation of couplers: easy hose rolling and handling
- Reduced weight and size: saves space, easy handling

Increased safety
Saves time
Easier handling
More efficient use of manpower
Increased flexibility

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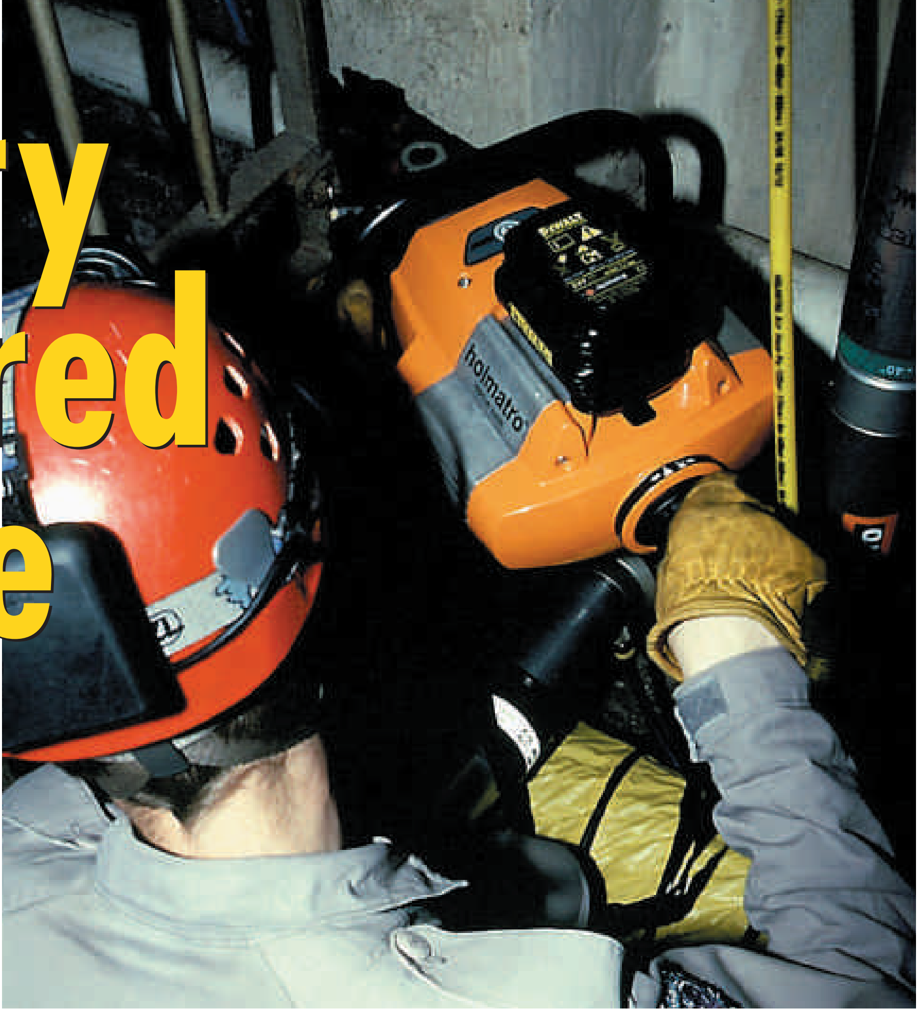
Battery Powered Rescue Tools

By Brendon Morris of Holmatro Rescue Equipment



With a battery powered rescue tool you do not have to worry about exhaust emissions polluting the working environment which is often very small

IN THE AFTERMATH OF the September 11th terrorists attacks there lay a rubble pile at ground zero so high that the ability to traverse it with traditional hydraulic rescue equipment was almost impossible. In this situation the solution was the extensive use of hand-powered hydraulics. Subsequently much has changed in the world of portable self-contained hydraulic extrication equipment. Most of these changes have developed due to various advances in technology that is technology in batteries and the development of micro hydraulic pumps.

Considering currently available technology there is no doubt that double acting hydraulics is the most effective way to power an extrication rescue tool. Hydraulic powered rescue tools provide the best power to weight ratio bearing in mind the type of forces required from this sort of equipment. With this understanding the next step is to decide on the best way to run the hydraulic pump used to create the hydraulic power required to operate a rescue tool. This dissection must be made based on various factors including where the pump and tools should be used and what sort of applications will be required. Traditionally the powering of hydraulic double acting rescue tools has always been achieved with petrol, diesel or electrically driven motors running the hydraulic pump. In recent years however battery and pump technology have made great advances.

With a compact, lightweight and yet powerful battery combitool you can easily take the power with you for rapid intervention, confined spaces and remote locations

Battery powered extrication tools have been around for many years but traditionally these tools have had some problems. Due to the limitations of older battery and pump technology these tools had to have separate batteries connected by cable to, the often, heavy tools. With batteries now far lighter and easier to charge than previously, as well as amazing innovation in the area of micro pump technology, the face of battery powered rescue tools has changed. Many of these tools are now totally self-contained. By making use of light weight battery technology and these new micro electrically powered hydraulic pumps, everything can be incorporated into the tool allowing for a completely self-contained package. These clever innovations have removed the need for pumps and hoses for these smaller capacity tools making them so much more versatile.

As one can imagine the applications for such tools are limitless, providing those of use working in the rescue world with flexibility not previously known. If one chooses the right tool the advantages are limitless. By being

One of the many situations in which a battery powered rescue tool is very useful: entrapment among the seats in a tram. No need for communication back to the pump, no hose that need to be re-threaded in and out of the windows to allow movement through the vehicle

completely self-contained and being not reliant on any external power source these tools really can be taken anywhere. We all remember a rescue situation we have been in where the need for a tool slung over the shoulder would have made all the difference. Accessing entrapments in remote locations becomes so much easier with a self-contained battery tool. I personally recall many extrication situations where vehicles had left the road and in some cases where only accessible using high angles rope access. On one of these occasions we even had to lower a hydraulic pump and tools down by rope as the hoses were not long enough to reach the scene. Having the ability to easily take the power with you will help avoid these sorts of situations.

Battery powered rescue tool very suitable for use in confined spaces

In wide body vehicles entrapments such as trains and buses my experience has shown me that most of the work for rescue tools is inside the vehicle. Entrapments are normally among the seats. This leads to the need for extensive work inside the vehicle. When we had to use traditional hose connected tools much time was taken arranging good communication to the outside of the vehicle where the pump was situated. There was also the need to constantly re-thread the hose in and out of the window openings to allow movement of the tools through the vehicle, which was very frustrating. Having a self-contained tool would certainly make a huge difference in such situations.

Another area to consider is the need for extrication inside buildings or confined spaces. Due to the use of clever battery powered hydraulics there is no concern for exhaust emissions. This makes it possible to use such a tool indoors or in confined spaces without having to worry about pollution of the working environment. This is handy for us rescuers, but also is more likely to endure use to the owners of the buildings we some times have to work in. Think for a second about the lobby of an expensive hotel with the elevator job, requiring your rescue equipment to be used inside.

Of course there are a few things one has to consider when choosing such a tool. Perhaps the most important is that one should not lose too much capacity of the tool by choosing the battery-powered route. The best way to ensure this is to check that the battery tool you chose is still actually hydraulic powered. In other words, while it is a battery tool are you sure that inside it is still converting this electric power to hydraulic capacity? Hydraulic power cannot be refuted as the most efficient way to power your extrication tool. In many cases this will also ensure that you have the lightest tool available. It is no good having this complete self-contained unit if it is too heavy to consider working with and carrying over long distance and possible difficult terrain. Finally one must be sure that you are in fact getting a fully self-contained package. In other words do not to be fooled into getting a battery powered hydraulic tool only to find that the tool will not work unless one connects a separate battery pack to it.

So what about "how long will the battery last"? This is a very important matter. A tool with a flat battery is no good to anyone. Probably the most important thing to consider here is not how long a battery will last as this can vary considerably depending on the work done. What is more important is that the battery can be quickly changed for a fresh one. In the rescue situation no matter what sort of equipment you are using there is always the possibility that your battery will last exactly 1 minute less than you need it to. For this reason the ability to change over to a freshly charged battery without to much bother is critical.

Modern battery powered hydraulic equipment has changed the face of extrication rescue. The portability of these tools allows them to be used in situations not ever considered before. Whether it be in the situation of a regular vehicle extrication job, on top of a rubble pile in a USAR situation, down a shaft in a confined space environment or inside a building, battery driven hydraulics saves many lives. I do hope that this overview of the technology behind them will help you in your choice of the best battery tool for your given need.

Brendon is a Rescue Paramedic currently employed as Consultation and Training Manger for Holmatro Rescue Equipment. His responsibilities include training Holmatro users and dealers worldwide on best rescue practice as well as researching rescue disciplines to ensure that Holmatro keeps pace with future rescue needs.

Ogura® PORTABLE RESCUE TOOLS

Battery-Powered Hydraulic Combi Tool
Model: BC-250

Ideal for:
- ● Collapsed Rescue
- ● Automobile Extrication
- ● EMS Rescue
- ● Remote Rescue
- ● Forcible Entry
- ● Aerial Rescue

Features:
- ■ Battery-Powered
- ■ Hydraulic Operation
- ■ No Setup Time
- ■ No Gasoline
- ■ Real Portability
- ■ No Trailing Hoses/Cables

Weight: 13.7 kg
Dimension: 692×344×198 mm with blades open
734×292×198 mm with blades closed
Cutting Force: Max. 266.8 kN (27.2 t) in the notch
Spreading Distance: 250 mm at the tips
Spreading Force: 39.2 kN (4 t) at the tips

Battery-Powered Hydraulic Rescue System
Model: HRS-93

HRS-932 Cutter Head
Cuts roof pillars, roofs, doors, steering wheels and others.
Weight: 6.2 kg
Cutting force: 10.0 t

HRS-932S "Stubby" Cutter Head
Ideal for tight locations such as security bars, padlocks, steel gates, chain, rebar, civil protest intervention.
Weight: 5.5 kg
Cutting force: 8.0 t

HRS-923 Pedal/Rod Cutter Head
Cuts 16 mm rebar, flat bar and chain.
Weight: 5.2 kg
Cutting force: 7.2 t

HRS-934 Spreader Head
Has jaws with very narrow tips that can be inserted into very small gaps.
Weight: 5.4 kg
Spreading force: 4.0 t

HRS-935 Door-Opener/Mini-Ram Head
Designed to rapidly breach doors. No tiresome hand pump. Can also be used as a mini-ram or Jack.
Weight: 4.3 kg
Opening force: 4.0 t

HRS-931 Pump-Unit
Weight: 4.4 kg

Weight: 10.6 kg

Weight: 9.9 kg

Weight: 9.8 kg

Connecting Tool Heads to the Pump by extension hose.

RESCUE CUTTER
Model: ORC-16HPW/ORC-19

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LION APPAREL

Innovative Fire Helmet System Launched

An innovative Fire Helmet System aims to be the first in the market to truly meet the needs of the modern firefighter.

The unique design of The Targa Helmet from **Modular Helmet Systems Ltd (MHSL)** allows it to be quickly and easily reconfigured in line with risk assessment by adding or removing different modules via a simple locking mechanism.

The lightweight base helmet is suitable for wildland, grassland and technical firefighting and for urban search and rescue work. By adding a comb assembly protection is gained for other fireground applications such as structural firefighting and hazardous materials work. The further addition of a lower helmet module then gives extra side and neck protection.

The Targa helmet also boasts a range of other safety and comfort features included as a result of a research and development programme that involved consultation with serving fire officers at every stage. For example, the base helmet is fully vented to maximise the escape of heat and minimise metabolic heat stress and the lower helmet module incorporates indirect hearing vents.

The Targa helmet has been launched via a joint venture between MHSL and Lion Apparel Systems who have over 100 years experience and expertise supplying fire markets worldwide. MHSL Managing Director, Mitch Tunnard, said, "Our lengthy consultation process with active firefighters has shown us that existing helmet systems do not always provide the degree of flexibility required due to the wide variety of risks faced by firefighters.

For example, it's a known fact that only 5% of a firefighter's time is spent exposed to worst case scenarios, yet traditional fire helmet systems are designed to meet these very scenarios. This can lead to firefighters being over protected and can exacerbate metabolic heat stress. Our multi-purpose Targa Helmet System has the adaptability and flexibility to perform a wide variety of tasks with the appropriate level of protection. It also has the major added benefit of individual modules being replaced if they are damaged rather than the entire helmet system, leading to major costs savings. All in all we believe that Targa represents the new standard in fire helmet systems and are therefore anticipating a healthy level of demand both in the UK and abroad."

The product specifications and features are as follows:

- T-Lock™ Locking mechanism
- All components manufactured from lightweight polyamide alloys and compliant with fire helmet standards EN443 1997 and EN166
- A top comb assembly for added impact protection, which can be colour-coded for role identification. A high visibility paint scheme option is also available.
- A lower helmet module, which provides full side and neck protection and incorporates indirect hearing vents
- An impact-resistant face shield, available with anti-scratch and anti-mist coatings.
- Simple sizing adjustment, through a head cradle and chin strap, to suit smaller head size – found in research to be particularly beneficial to many female firefighters and some ethnic minority groups
- Easy adaptability to breathing apparatus, communication systems and external light options

For more information, contact

LION APPAREL
ASIA PACIFIC
PO Box 2555, Regency Park
South Australia, 5942
Tel: + 61 (0) 8 8139 7777
Fax: + 61 (0) 8 8139 7788
Email: lionasia@lionapparel.com

Q: What do you get if you ask a Firefighter to design a helmet?

A: One that's right for the job.

The Targa Fire Helmet System is the first to truly meet the needs of today's Fire Fighter. Its unique modular design allows the Helmet to be quickly and easily adapted in line with the wide variety of tasks fire fighters are required to perform. The result is a system that offers superior protection and safety plus excellent wearer comfort.

1 CONFIGURATION			The lightweight, full vented, Base Helmet is suitable for Wildland and Grassland Firefighting, Urban rescue and Technical work.	
2 CONFIGURATION			The addition of a Comb Assembly gives increased impact protection for Structural Firefighting and other Fireground and Rescue applications.	
3 CONFIGURATION			Adding the Lower Helmet Module provides full side and neck impact protection.	

For more information contact

Lion Apparel – Asia Pacific
PO Box 2555, Regency Park
South Australia, 5942
Phone: + 61 (0) 8 8139 7777
Fax: + 61 (0) 8 8139 7788
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DESIGNED BY FIREFIGHTERS,
FOR FIREFIGHTERS.

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CONTRACT RETAIL
Don’t all firefighters deserve the best?

40 YEARS Duraline

If they gave a long-service medal to fire hoses, only one would qualify. For forty years Duraline has provided outstanding performance to firefighters around the world. It has carried the BSI Kitemark symbol of product quality for longer than any other covered fire hose. And to this day it still offers the lowest possible maintenance costs. Duraline, the only hose that truly passes the test of time.

ANGUS FIRE

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A Kidde Company

LAYFLAT FIREFIGHTING HOSE MARKET GUIDE

ANGUS FIRE

COMPANY	Angus Fire	Angus Fire	Angus Fire
BRAND NAME	Duraline	Firechief	Flamefighter
ORIGIN	UK	UK	UK
HOSE TYPE (Type 1, 2 or 3)	Type 3	Type 3 Economy covered fire hose	Type 2
MATERIALS/CONSTRUCTION	Special high-grade synthectic rubber cover extruded through all polyamide (nylon) Jacket. Features the best rubber-to-textile adhesion that modern technology can achieve surpassing cheaper polyester alternatives	All-in-One extruded fire hose constructed from unique low-density synthetic rubber with a textile reinforcement locked in	All synthetic woven textile jacket incorporating a double warp feature for added abrasion resistance. The hose is externally protected by a tough heat resistance coating. Features unique internally reinforced lining
Which Standards/Approvals does this hose apply to	BSI Kitemark to BS 6291: Type 3, UL UK Maritime & Coastguard Agency Lloyd's Register, Det Norske Veritas BS EN ISO 9001:2000	Conforms to BS 6391: Type 3 UK Maritime & Coastguard Agency BS EN ISO 9001:2000	Conforms to BS 6301: Type 2 BS EN ISO 9001:2000
WHAT SPECIAL FEATURES DOES THIS HOSE HAVE	Unique top-performing rubber formulation is a closely guarded secret! The only hose in the world with vacuum-sealed pinholes to resist attack by aggressive chemicals. Exceptional resistance to kinking, heat, chemicals, ozone and UV	The thick outer cover gives extra protection against impact and abrasion resistance together with protection against oil and chemicals	Unique Angus Reinforced Rubber Lining (RRL). The inner lining is enveloped by a fine-meshed fabric sleeve which is bonded to the outer textile reinforcement. It is this textile that gives Flame-fighter its unique unique 'hose within a hose' characteristic.
COUPLING TYPE	Supplied with all leading coupling types included BS 336 British instantaneous and Round Thread, Screw Thread (NH/NST), Hermaphrodite (Storz) and French Symetrique. Available in aluminium and gunmetal	Supplied with all leading coupling types included BS 336 British instantaneous and Round Thread, Screw Thread (NH/NST), Hermaphrodite (Storz) and French Symetrique. Available in aluminium and gunmetal	Supplied with all leading coupling types included BS 336 British instantaneous and Round Thread, Screw Thread (NH/NST), Hermaphrodite (Storz) and French Symetrique. Available in aluminium and gunmetal
PRESSURE LOSS SOFTWARE SUPPLIED?	Free Angus HoseCalc software available at www.angusfire.co.uk	Contact Angus Fire	Contact Angus Fire
WHAT TYPE OF DEPARTMENT USES YOUR HOSE	500 Fire Departments and 200 Oil & Chemical companies worldwide. The number one fire hose of the British Fire Service	Industrial, Petrochemical, Offshore, Aviation and Marine	Industrial, Petrochemical, Offshore, Aviation and Marine

Angus Fire
Thame Park Road, Thame
Oxfordshire OX9 3RT UK
Tel: +44 1844 265000
Fax: +44 1844 265156
E-mail: general.enquiries@kiddeuk.co.uk
Website: www.angus-fire.com

COMPANY	Angus Fire	Angus Fire
BRAND NAME	Coverlite	Hydra
ORIGIN	UK	UK
HOSE TYPE (Type 1, 2 or 3)	High performance Type 2 covered fire hose at an economic price	Complies with Type 1 & Type 2 requirements
MATERIALS/CONSTRUCTION	Special high-grade synthetic rubber cover extruded through all synthetic jacket	Features smooth low friction-loss synthetic rubber lining inserted in a high strength circular woven synthetic polyester jacket. Available in 2 grades. Hydra A in a plain white uncoated conventional hose. Hydra B has an external coating of abrasion resistant polyurethane available in a wide choice of colours
Which Standards/Approvals does this hose apply to	Conforms to BS 6301: Type 2 UK Maritime & Coastguard Agency Lloyd's Register, BS EN ISO 9001:2000	BS 6391 Type 1 and BS 6391 Type 2 Hose
WHAT SPECIAL FEATURES DOES THIS HOSE HAVE	Lightweight and highly flexible for easy handling	Offers the latest in lightweight hose technology. Unique fully synthetic construction combines maximum performance with the lightest weight for easy handling
COUPLING TYPE	Supplied with all leading coupling types included BS 336 British instantaneous and Round Thread, Screw Thread (NH/NST), Hermaphrodite (Storz) and French Symetrique. Available in aluminium and gunmetal	Supplied with all leading coupling types included BS 336 British instantaneous and Round Thread, Screw Thread (NH/NST), Hermaphrodite (Storz) and French Symetrique. Available in aluminium and gunmetal
PRESSURE LOSS SOFTWARE SUPPLIED?	Free Angus HoseCalc software available at www.angusfire.co.uk	Contact Angus Fire
WHAT TYPE OF DEPARTMENT USES YOUR HOSE	Municipal Fire Services, Chemical & Petro-Chemical Industrial Fire Services, Military Bases, Power Stations, Harbours, Terminals, Jettiies, Shipping, Building Protection and General Industry	Industrial Fire Services, Rural Fire Services, Marine General Industry and washdown

MANDALS A/S

COMPANY	Mandals A/S	Mandals A/S	Mandals A/S
BRAND NAME	Mandals Guardman	Mandals Mertex	Mandals Martex
ORIGIN	Norway	Norway	Norway
HOSE TYPE (Type 1, 2 or 3)	Type 3 (to BS 6391)	Type 2 (to BS 6391)	Type 2 (to BS 6391)
MATERIALS/CONSTRUCTION	Blend of Nitrile rubber/PVC extruded through a circular woven polyester jacket	Circular woven polyester jacket with internally extruded polyurethane liner	Circular woven polyester jacket with an internal EPDM liner
Which Standards/Approvals does this hose apply to	NS 4016-4018, SS 2840, DIN 14811, NEN 2242, BS 6391 Type 3 1981, EN 671-2 (pr.EN 1924-2: 1995), Det Norske Veritas, DOT UK, Lloyds Register, Bureau Veritas, American Bureau of Shipping, DnV Marine Equipment	NS 4061, 4017, 4018, SS 2840, BS 6391, EN 671-2 (pr, EN 1924-2: 1995), Norwegian Maritime Directorate, National Maritime Administration Sweden Danish Maritime Authority, DOT UK, Australian Maritime Safety Authority, Bureau Veritas, Maritime Equipment (Wheel Mark)	NS 4061, 4017, 4018, SS 2840, BS 6391, EN 671-2 (pr, EN 1924-2: 1995), Det Norske Veritas, Norwegian Maritime Directorate, Danish Maritime Authority, DOT UK, Lloyds Shipping UK, Bureau Veritas France, China Classification Society, PR China, Australian Maritime Safety Authority
WHAT SPECIAL FEATURES DOES THIS HOSE HAVE	Hose has high resistance to wear and tear as well as de-lamination due to the "through the weave extrusion" production method. It has high tolerances to many industrial chemicals and can be used in a wide variety of applications other than firefighting	Hose is extremely lightweight with extra bonding between cover and liner due to the liner extrusion process	
COUPLING TYPE	Hose can fit all standard layflat firehose couplings presently on the market	Hose can fit all common layflat firehose couplings on the market	Hose can fit all common layflat firehose couplings on the market
PRESSURE LOSS SOFTWARE SUPPLIED?	No, but pressure drop tabularies available on request	No, but pressure drop tabularies available on request	No, but pressure drop tabularies available on request
WHAT TYPE OF DEPARTMENT USES YOUR HOSE	Fire Brigades, Offshore Oil & Gas Platforms, Shipping worldwide and general industry	Hose used by fire brigades, industrial fire brigades and maritime industry	Hose is mainly used by marine industry for firefighting purposes

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NIEDNER

COMPANY	Niedner	Niedner	Niedner	Niedner
BRAND NAME	TIDALWAVE 600	SUPPLYLINE	STANDPIPE 600	POWERLINE
ORIGIN	Canada	Canada	Canada	Canada
HOSE TYPE (Type 1, 2 or 3)	Type 1 or 2	Type 1 or 2	Type 2	Type 2
MATERIALS/CONSTRUCTION	100% polyester w/TPU Elastomer	100% polyester w/TPU Elastomer	100% polyester w/TPU Elastomer	100% polyester w/EPDM
Which Standards/Approvals does this hose apply to	Potable water approved	Potable water approved – meets UL specs		
WHAT SPECIAL FEATURES DOES THIS HOSE HAVE	Lightweight, comes in different colors	Lightweight, comes in different colors	Lightweight hose – supports standpipe systems	Lightweight, extreme attack situations
COUPLING TYPE	LOCKING Storz or Aluminum threaded	LOCKING Storz or Aluminum threaded	Aluminum/Brass threaded couplings – Storz	Aluminum/Brass threaded couplings – Storz
PRESSURE LOSS SOFTWARE SUPPLIED?	No	No	No	No
WHAT TYPE OF DEPARTMENT USES YOUR HOSE	Volunteer/Full Time Fire Departments Industrial market	Volunteer/Full time Fire Departments	Big city fire departments	Any type of fire department

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675 Merrill Street , Coaticook ,
Quebec J1A 2S2 Canada
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Website: www.niedner.com

COMPANY	Niedner	Niedner	Niedner	Niedner
BRAND NAME	ULTRA 2000	ULTRA FORCE 2000	XL-800	RXL-800
ORIGIN	Canada	Canada	Canada	Canada
HOSE TYPE (Type 1, 2 or 3)	Type 2	Type 2	Type 1 or 2	Type 1 or 2
MATERIALS/CONSTRUCTION	100% polyester – TPU Elastomer	100% polyester – EPDM Elastomer	100% polyester – TPU Elastomer	100% polyester – TPU Elastomer
Which Standards/Approvals does this hose apply to				
WHAT SPECIAL FEATURES DOES THIS HOSE HAVE	Lightweight, comes in different colors, use for potable water	Lightweight, comes in different colors	Lightweight, comes in different colors, use for potable water, meets UL specs	Lightweight, comes in different colors
COUPLING TYPE	Aluminum/Brass threaded couplings – Storz	Aluminum/Brass threaded couplings – Storz	Aluminum/Brass threaded couplings – Storz	Aluminum/Brass threaded couplings – Storz
PRESSURE LOSS SOFTWARE SUPPLIED?	No	No	No	No
WHAT TYPE OF DEPARTMENT USES YOUR HOSE	Any type of fire department	Any type of fire department	Any type of fire department	Any type of fire department

PRODUCTOS MESA

COMPANY	Productos Mesa	Productos Mesa	Productos Mesa
BRAND NAME	ATLAS®	ATLAS-C®	GOMTEX®
ORIGIN	Spain	Spain	Spain
HOSE TYPE (Type 1, 2 or 3)	Type 1	Type 2	Type 3
MATERIALS/CONSTRUCTION	Outer polyester and inner liner (rubber, PU, thermoplastics)	Outer polyester, inner liner (rubber, PU, thermoplastics) and outer PU coating	Extruded through the weave construction. Rubber and polyester
Which Standards/Approvals does this hose apply to	UNE, NF, EN, DNV (SOLAS)	UNE, NF, EN, DNV (SOLAS)	UNE, NF, EN, DNV (SOLAS), BS 6391:83
WHAT SPECIAL FEATURES DOES THIS HOSE HAVE	Hose suitable for industrial fire brigades and low cost requirements	Hose suitable for higher chemical and abrasion resistance than conventional style of hoses	Low pressure loss, high abrasion resistance, oil resistance, heat resistance. Excellent value
COUPLING TYPE	Any style	Any style	Any style
PRESSURE LOSS SOFTWARE SUPPLIED?	Yes, on demand	Yes, on demand	Yes, on demand
WHAT TYPE OF DEPARTMENT USES YOUR HOSE	Industries, Fire Brigades, Petrochemicals, Refineries, Mines, Offshore, etc	Industries, Fire Brigades, Petrochemicals, Refineries, Mines, Offshore, etc	Industries, Fire Brigades, Petrochemicals, Refineries, Mines, Offshore, etc

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La Rioja
Spain
Tel: +34 94 134 1546
Fax: +34 94 134 2254
E-mail: export@productosmesa.com
Website: www.productosmesa.com

COMPANY	Productos Mesa	Productos Mesa
BRAND NAME	GOMDUR-4K®	FLEXIGOM®
ORIGIN	Spain	Spain
HOSE TYPE (Type 1, 2 or 3)	Type 3	Type 3
MATERIALS/CONSTRUCTION	Extruded through the weave 4 layer construction. Rubber and polyester	Extruded through the weave construction
Which Standards/Approvals does this hose apply to	UNE	
WHAT SPECIAL FEATURES DOES THIS HOSE HAVE	Fire brigade, petrochemicals and heavy industries superior hose reinforced with Kevlar® and Hypalon®	Industry, irrigation hose
COUPLING TYPE	Any style	Any style
PRESSURE LOSS SOFTWARE SUPPLIED?	Yes, on demand	Yes, on demand
WHAT TYPE OF DEPARTMENT USES YOUR HOSE	Industries, Fire Brigades, Petrochemicals, Refineries, Mines, Offshore, etc	Industry, irrigation, heavy compressed air works, water wells, pumping

SNAP-TITE

COMPANY	Snap-tite Hose	Snap-tite Hose	Snap-tite Hose
BRAND NAME	Type 'LD'	Type 'HFX'	Type '6D'
ORIGIN	Singapore/Melbourne AU	Singapore/Melbourne AU	Singapore/Melbourne AU
HOSE TYPE (Type 1, 2 or 3)	Type 3	Type 3	Type 3
MATERIALS/CONSTRUCTION	Nitrile Rubber with Nylon reinforcement – 600 psi Burst	Nitrile Rubber with Polyester/Nylon reinforcement – max 900 psi Burst	Double Jacket Polyester, Rubber Lined – 900 psi Burst
Which Standards/Approvals does this hose apply to	BS 6391, Kite Mark, U.K. Dept of Transports, Marine Safety Agency, Det Norske Veritas, AU-5195, AU-2792-H, ABS Type Approval'	UL, ULC	UL, FM, ULC
WHAT SPECIAL FEATURES DOES THIS HOSE HAVE			
COUPLING TYPE	British Instantaneous, NST, IPT, Storz	NST (NH), IPT(NPSH), Storz	NST (NH), IPT(NPSH), Storz
PRESSURE LOSS SOFTWARE SUPPLIED?	Yes	Yes	Yes
WHAT TYPE OF DEPARTMENT USES YOUR HOSE	Municpal & Industrial Fire, Airports, Forestry	Municpal & Industrial Fire, Airports	Municpal & Industrial Fire, Airports, Forestry

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Website: www.snap-titehose.com

MACRON SAFETY SYSTEMS (UK) LTD

COMPANY	Tyco Safety Products (Macron)	Tyco Safety Products (Macron)	Tyco Safety Products (Macron)
BRAND NAME	Viking	Saracen	Saxon
ORIGIN			
HOSE TYPE (Type 1, 2 or 3)	Type 3	Type 3	Type 1 and 2
MATERIALS/CONSTRUCTION	Polyamide/polyester woven textile jacket, nitrile-pvc rubber lining, ribbed nitrile-pvc cover	Polyamide/polyester woven textile jacket, nitrile-pvc rubber lining and cover	All synthetic coated or uncoated synthetic rubber lining with close woven tweill polyester filament yarns
Which Standards/Approvals does this hose apply to	UK Home Office Spec JCDD 1/1, BS 6391:1983	BS 6391:1983	BS 6391:1983
WHAT SPECIAL FEATURES DOES THIS HOSE HAVE	Excellent heat resistance, provides good protection against accidental ember contact, oil and chemical resistant, weather resistant, maintenance free, easy to repair	Excellent heat resistance, oil and chemical resistant, weather resistant, maintenance free, easy to repair	No drying time – quick to stow, flexible, small coil size, lightweight yet strong, assorted colours. Ideal as washdown hose.
COUPLING TYPE	Standard Industrial, British Instantaneous, German Storz, American NSFHT, French Guillemin, Symmetrique	Standard Industrial, British Instantaneous, German Storz, American NSFHT, French Guillemin, Symmetrique	Standard Industrial, British Instantaneous, German Storz, American NSFHT, French Guillemin, Symmetrique
PRESSURE LOSS SOFTWARE SUPPLIED?			
WHAT TYPE OF DEPARTMENT USES YOUR HOSE	Fire Bridages, petro chemical, marine, offshore, major industrial, defence, aviation, govt depts	Private sectors	Fire brigades, industrial users

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Fax: +44 1493 858 374
E-mail: macron-info@tycoint.com
Website: www.macron-safety.com

VAN RULLEN

COMPANY	Van Rullen	Van Rullen	Van Rullen
BRAND NAME	VI-Z	VI-M	VC-Z
ORIGIN	Belgium	Belgium	Belgium
HOSE TYPE (Type 1, 2 or 3)	Type 1	Type 2	Type 1
MATERIALS/CONSTRUCTION	Outside: synthetic woven textile reinforcement Inside: EPDM rubber	Outside: synthetic woven textile reinforcement Inside: EPDM rubber	Outside: synthetic woven textile reinforcement Inside: EPDM rubber
Which Standards/Approvals does this hose apply to	DIN-approval	DIN-approval	DIN 14811, NBN S21-024, Veritas MED approval
WHAT SPECIAL FEATURES DOES THIS HOSE HAVE	Maintenance free: do not need drying, unaffected by mildrew, resistant against ozone, rot-proof	Maintenance free: do not need drying, unaffected by mildrew, resistant against ozone, rot-proof	Maintenance free: do not need drying, unaffected by mildrew, resistant against ozone, rot-proof
COUPLING TYPE	Available with DSP, Storz, Guillemin, Instantaneous, Nakajima	Available with DSP, Storz, Guillemin, Instantaneous, Nakajima	Available with DSP, Storz, Guillemin, Instantaneous, Nakajima
PRESSURE LOSS SOFTWARE SUPPLIED?			
WHAT TYPE OF DEPARTMENT USES YOUR HOSE	Industrial purposes, Building Industry, Agriculture	Industrial purposes, Building Industry, Agriculture	Industrial purposes, Building Industry, Agriculture, Navigation, Fire Brigades

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Website: www.vanrullen.com

COMPANY	Van Rullen	Van Rullen
BRAND NAME	VC-M	Duraflex
ORIGIN	Belgium	Belgium
HOSE TYPE (Type 1, 2 or 3)	Type 2	Type 3
MATERIALS/CONSTRUCTION	Outside: synthetic woven textile reinforcement Inside: EPDM rubber	All-in-one contruction of low density nitril rubber with synthetic textile reinforcement locked in
Which Standards/Approvals does this hose apply to	DIN 14811, NBN S21-024, Veritas MED approval	DOT approved, BSS, NEN, DIN
WHAT SPECIAL FEATURES DOES THIS HOSE HAVE	Maintenance free: do not need drying, unaffected by mildrew, resistant agianst ozone, rot-proof, excellent abrasion resistance	Maintenance free: do not need drying, highly flexible and lightweight, ozone resistant, hardwearing-resistant to abrasion, oil and chemicals, excellent kink resistance
COUPLING TYPE	Available with DSP, Storz, Guillemin, Instantaneous, Nakajima	Available with DSP, Storz, Guillemin, Instantaneous, Nakajima
PRESSURE LOSS SOFTWARE SUPPLIED?		
WHAT TYPE OF DEPARTMENT USES YOUR HOSE	Industrial purposes, Building Industry, Agriculture, Navigation, Fire Brigades	Fire Brigades, Industrial purposes, Building industry, Agriculture, pumps

VAN RULLEN
Kidde

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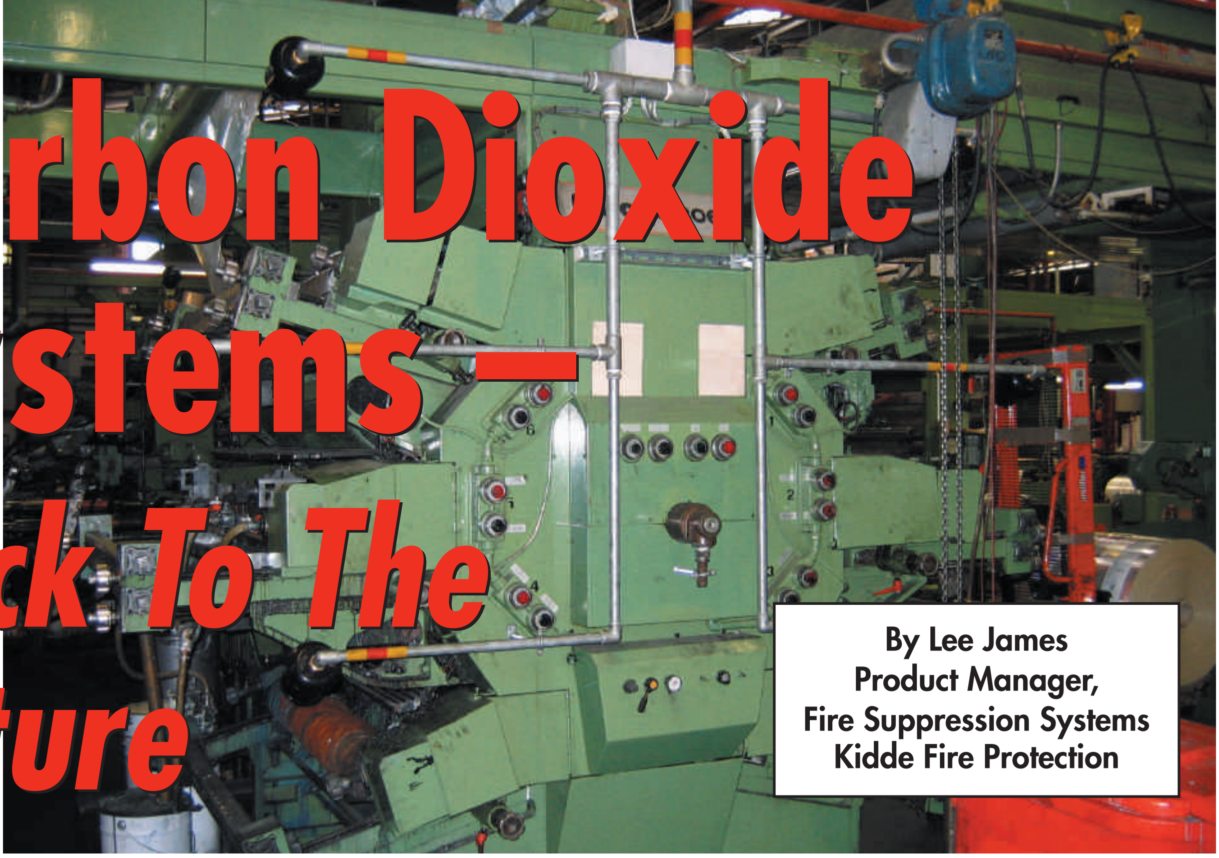
Carbon Dioxide Systems – *Back To The Future*



By Lee James
Product Manager,
Fire Suppression Systems
Kidde Fire Protection

Pic courtesy of Kidde Fire Protection

CARBON DIOXIDE (CO_2) was the original "clean" gaseous fire suppression agent pioneered over eighty years ago. Since then it has safely extinguished more fires than any other gaseous agent. Today CO_2 remains the most cost-effective agent of choice for a multitude of critical industrial processes and manufacturers continue to invest heavily in its technical development.

The story begins in 1923 when American engineer Walter Kidde first harnessed the fire extinguishing power of CO_2. He developed the world's first ever fire detection and CO_2 extinguishing system to protect engine rooms and cargo spaces on board ships. The use of this new agent quickly spread from shipboard to dry land, and the industrial fixed CO_2 system was born. This landmark event also led to the development of the portable CO_2 extinguisher.

Over the decades there have been several advances in CO_2 technology. This has led to the NFPA Standard 12 "Carbon Dioxide Extinguishing Systems" being revised over thirty times since it was first published in 1928. Major advances have included enhancements to cylinder, valve and nozzle design; improvements in safety; remote monitoring of cylinder contents; modern design engineering software; and integration with state-of-the-art fire detection and alarm systems.

ENVIRONMENTAL IMPACT

CO_2 was the world's most popular gaseous suppression agent for many years until the introduction of Halon. Now that Halon is no longer acceptable for environmental reasons, CO_2 is enjoying renewed recognition and acceptance.

CO_2 occurs naturally in the atmosphere, and it therefore has no restrictions on its use in fire fighting. It has a zero Ozone Depletion Potential (ODP) and so has no effect on the stratospheric ozone layer. It has a Global Warming Potential (GWP) of one, but its use in fire protection is insignificant compared with the potential damage caused by an uncontrolled fire or the large quantities of CO_2 emitted as a by-product of many industrial processes.

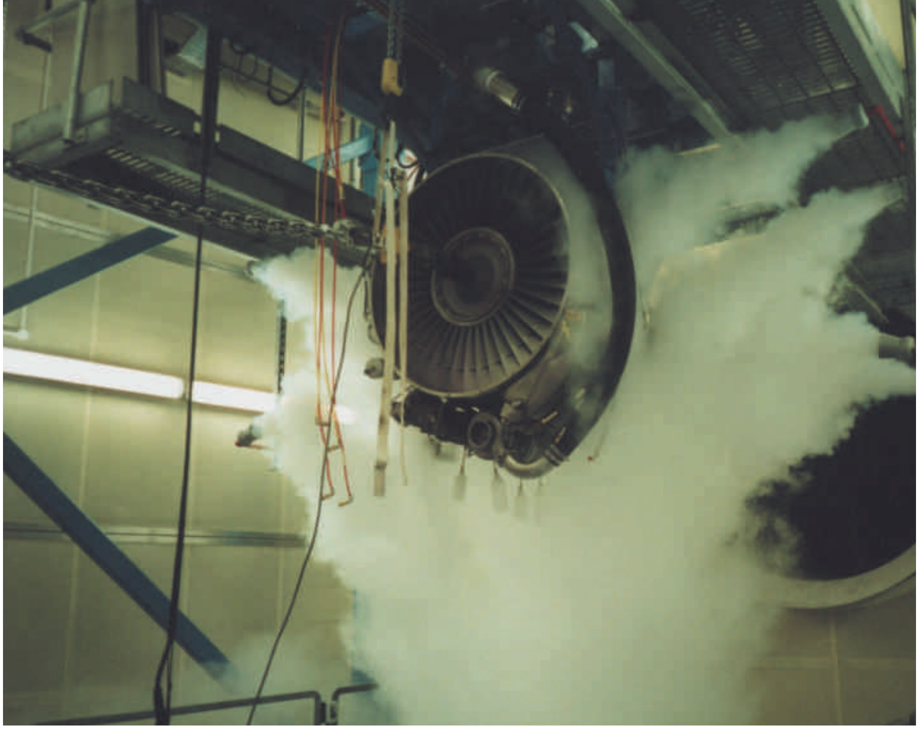
Walter Kidde

Another big advantage of CO_2 is that it is relatively inexpensive. This is because the cost of storage and distribution is spread over a wide range of industries, most notably beverage carbonation. This also means that CO_2 is readily available world wide for low-cost re-charge.

FIRE PERFORMANCE

CO_2 is a gas that is stored under pressure as a liquid in steel cylinders. It is piped to the protected hazard, where it is released by the required number and type of discharge nozzles at a minimum concentration of 34%.

It expands on release to form a combination of gas and fine particles of solid CO_2 or "dry ice". The gas penetrates the hazard area and extinguishes the fire primarily by reducing the oxygen concentration in the atmosphere to less than 15%. In addition, as the dry ice sublimes (changes to gas) it provides localised cooling. The dry ice particles also enable the extinguishant to be projected over much greater distances than would be possible with gas alone.



Pic courtesy of Kidde Fire Protection

The importance of good system design in ensuring effective performance cannot be overstated. System component approvals, recognised standards such as NFPA 12 and BS 5306 Part 4, designer training and experience all play a part in determining a good CO_2 system design.

CO_2 systems should be serviced regularly, taking particular care to ensure no leakage of agent. Some manufacturers offer Weight Indicator Mechanisms to automatically monitor the contents of CO_2 cylinders. When the contents of the cylinder fall by a pre-determined amount, typically 10%, the weight drop causes a micro-switch to trip and send a signal to a control panel.

CO_2 systems do not leave any residue behind. The gas dissipates to the atmosphere and there is no need for any costly and time-consuming clean-up operations. CO_2 is truly a "clean" agent, discharging as a colourless, odourless, electrically non-conductive, and non-corrosive gas.

SYSTEM SAFETY

It is well known that CO_2 at fire extinguishing levels can cause death by asphyxiation to personnel who might inadvertently be in the hazard area. While it is widely used in unmanned applications, it is also acceptable for use in manned areas provided suitable safety measures are adopted. These are covered in NFPA 12 and manufacturers' safety and operation manuals.

Visual and audible warnings, clearly marked exit routes, and time delays on door closure must be provided to give occupants enough time to evacuate the area prior to discharge. Odoriser may be used to give a distinctive smell to the CO_2 discharge, and a continuous alarm should be sounded until the atmosphere is safe. Search and rescue drills should also be carried out by trained personnel with BA sets since a person rendered unconscious by CO_2 can be revived if first aid is administered promptly.

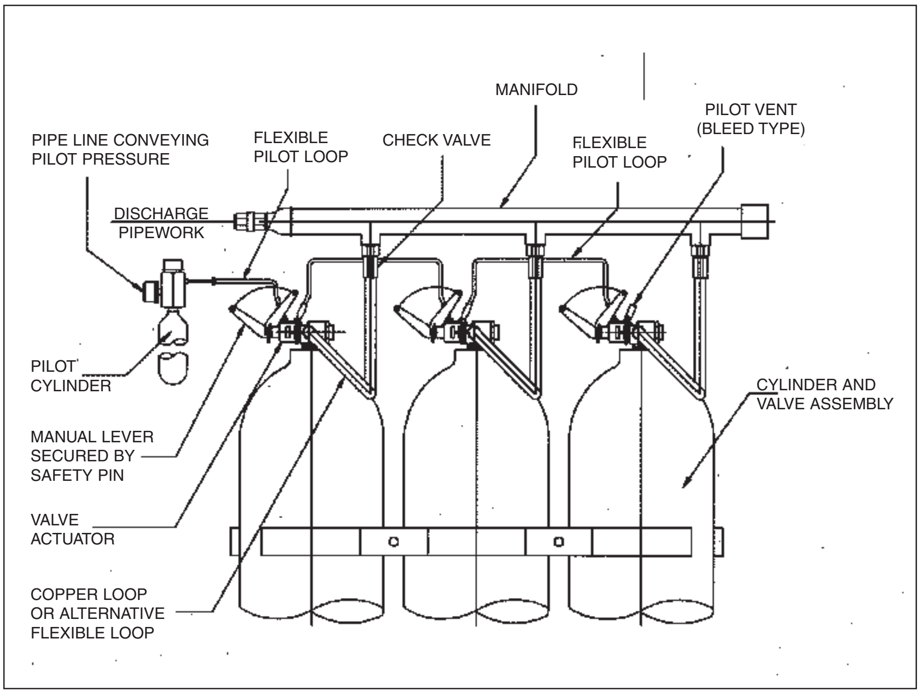
Adequate post-discharge ventilation of the flooded areas should be provided to prevent accidental exposure of personnel to dangerous levels of CO_2 when returning to the area and also in adjoining spaces. CO_2 tends to migrate to low-lying areas near the protected hazard following a discharge because it is 1.5 times heavier than air.

CO_2 has a proven track-record of safety when these simple measures are taken. Over 100,000 systems installed world wide over the past fifty years show that it can be used safely.

HIGHLY VERSATILE

The versatility of applications is what gives CO_2 its true uniqueness. It has physical characteristics that allow it to be used to suppress fires in a wider variety of applications than any other gaseous agent. It is effective on a broad range of Class A, B and electrical fires. It can be used as a "total flooding" agent in enclosed spaces, or in "local application" for unenclosed equipment protection, or in a combination of both.

Total flooding represents the majority of CO_2 systems. The cost of CO_2 is so much less than other gaseous agents, that where large volumes are to be flooded or where discharges are frequently required, the economic advantage of CO_2 cannot be ignored. Extended discharge to hold the gas concentration for long enough to allow for elimination of any re-ignition source also becomes affordable when using CO_2. Typical applications include industrial ovens, generators, switch rooms, paint spray booths, exhaust fume ducts, transformers, stores and archives.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FLEXIBLE PILOT LOOP
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PILOT CYLINDER
CYLINDER AND VALVE ASSEMBLY
MANUAL LEVER SECURED BY SAFETY PIN
VALVE ACTUATOR
COPPER LOOP OR ALTERNATIVE FLEXIBLE LOOP

Carbon Dioxide Cylinder and Klem Valve Assembly

Local application is widely used where stand-alone items of equipment or processes are not contained within walls to allow flooding techniques to be adopted. It consists of an array of nozzles placed so that the discharge covers the entire hazard. The rate of CO_2 discharge, the distance from the nozzles to the protected equipment, and the design of the nozzle all figure in the design of the system. The hazard can be totally without enclosure walls but partial enclosures will reduce the CO_2 requirements. Typical applications include industrial fryers, generators, transformers, flammable liquid storage, printing machines, quench tanks and the automotive industry.

BASIC OPERATION

When a fire is detected, an electrical signal from the control panel is sent to a solenoid/control head assembly mounted on top of a nitrogen pilot cylinder. The pilot gas flows from the cylinder to the first valve actuator through a hard pipe and a flexible loop, which opens the valve for the first CO_2 cylinder. Subsequent cylinders are fired via their respective actuators in the same way. The CO_2 gas is discharged through the valve outlet, flexible outlet hose, check valve, manifold, pipe work and finally the nozzle. Levers are mounted on each actuator for manual operation and secured by a safety pin. A pilot vent is screwed into the vacant port on the last actuator to relieve pressure in the actuation line following the CO_2 discharge.

MULTIPLE HAZARD SYSTEMS

Simple single hazard risks form the majority of CO_2 systems. However, more complicated multiple hazard systems can also be protected. Multiple hazards can be protected from a common cylinder bank by the use of Pressure Operated Directional (POD) or selector valves. The directional valves are normally operated by pilot cylinder pressure, while switches and other accessories are normally operated either by pilot cylinder or CO_2 discharge pressure. The pilot line controls are operated electrically, pneumatically or manually depending on the system design philosophy. Multi-zone hazards can be effectively protected with relatively few CO_2 cylinders provided the risk of more than one hazard requiring protection at the same time and/or requirements for main and reserve cylinders are taken into account at the design stage. This makes multiple hazard directional valve systems very cost effective in the right situation.

Pic courtesy of Kidde Fire Protection

STANDARDS & APPROVALS

CO_2 system cylinders and components should comply with the latest international standards. These include US Department of Transportation, and European Directives such as Pressure Equipment Directive (PED), Transportable Pressure Equipment Directive (TPED), and Construction Products Directive (CPD). Top independent listing and approval agencies for CO_2 systems include FM Global, American Bureau of Shipping, UK Maritime and Coastguard Agency, Lloyd's Register, Germanischer Lloyd, Det Norske Veritas, China Classification Society, NKK Japan and the Australian Standard 4214.1.

THE WAY FORWARD

The original "clean" fire suppression agent, CO_2 offers fire engineers a unique combination of versatility and cost-effectiveness. Properly designed and maintained systems provide excellent fire suppression performance, and are acceptable for use in manned areas provided adequate safety measures are taken. Its environmental credentials mean it has no restrictions on its use in fire fighting, and its extinguishing characteristics make it ideal for a wide range of marine and industrial applications.

If Walter Kidde were alive today he would surely take enormous pride in the fact that demand for the CO_2 fixed systems that he developed all those years ago continues to grow in all parts of the world. But perhaps his greatest source of pride would be the countless lives that have been saved, and continue to be saved, by the technology that he pioneered and which continues to be developed.

Lee James has over twenty years in the fire protection industry, and in that time has built up a worldwide reputation as an acknowledged expert on gaseous clean agent fire suppression systems. He is Product Manager at Kidde Fire Protection for Fire Suppression Systems, and is responsible for the global marketing of systems incorporating CO_2, FM-200, Argonite, and 3M™ Novec™ 1230 Fire Protection Fluid. He has travelled extensively around the world giving lectures, including a recent series of technical seminars on CO_2 systems in the Far East. Delegates attended from Thailand, Indonesia, Vietnam, Malaysia, Hong Kong, Taiwan and Singapore.

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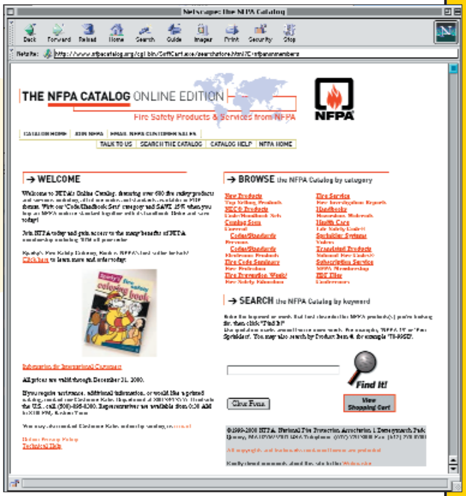
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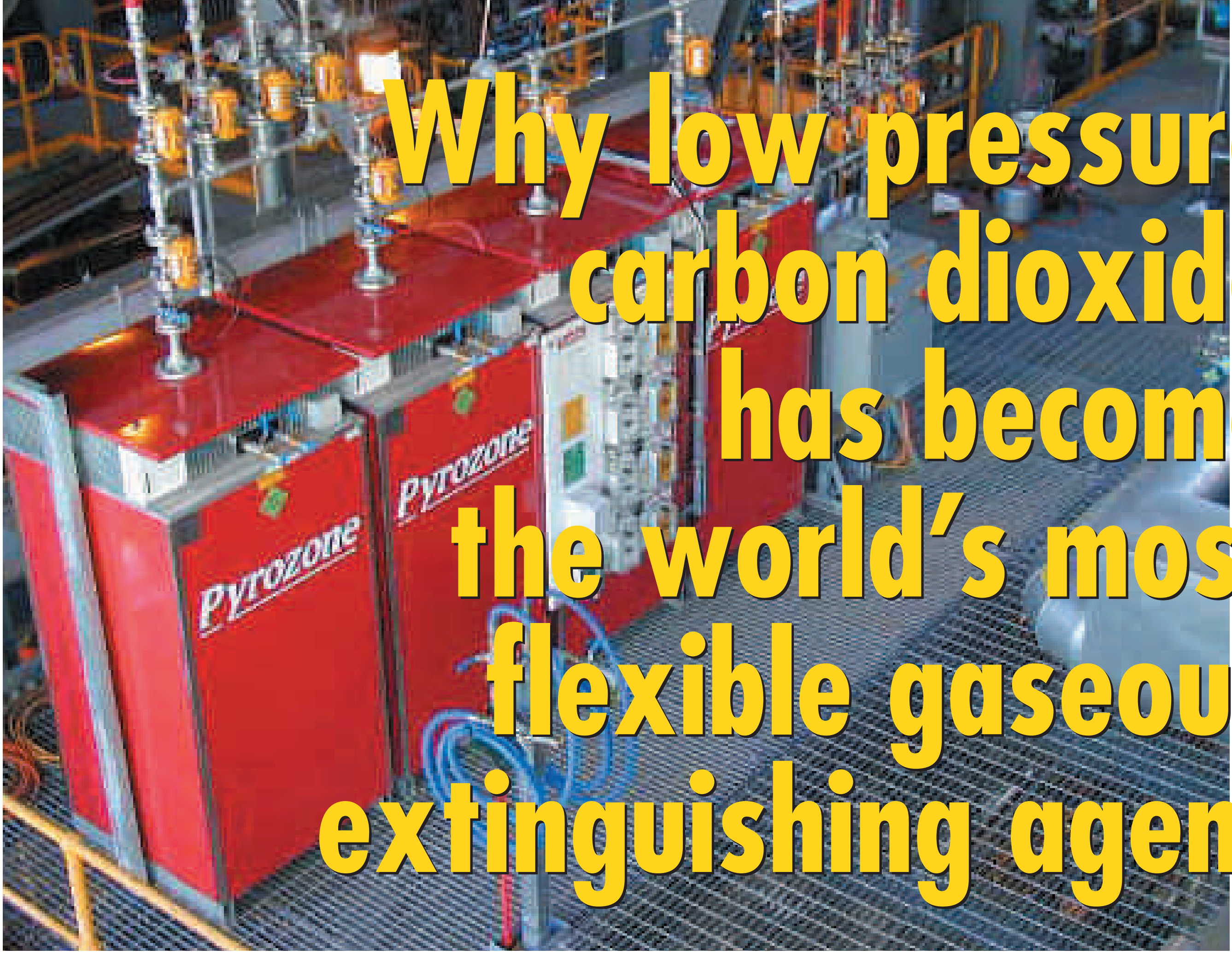
Why low pressure carbon dioxide has become the world's most flexible gaseous extinguishing agent



Pic courtesy of Pyrozone Manufacturing Pty Ltd

By James Allison – Pyrozone Manufacturing Pty Ltd.

INTRODUCTION TO LOW PRESSURE

The term "low pressure" may seem a misnomer because low pressure containers are still about 20 times atmospheric pressure, or about 10 times the pressure in your car tires. It is low however, compared to the pressure of a quantity of carbon dioxide in a cylinder allowed to be at whatever pressure it wants and it turns out that cylinder pressure is in proportion to ambient temperature. Such cylinders are known as "high pressure" cylinders. To achieve "low pressure" storage the containers are refrigerated since the lower the temperature, the lower the pressure. It has been common practice with low pressure containers to hold the carbon dioxide at about minus 18°C. This lower pressure allows thinner walled containers.

Carbon dioxide is the world's most used industrial gas with uses ranging from food preservation to fire protection. Interestingly, in a recent breakthrough it shows promise as a benign solvent in replacing volatile organic solvents such as chlorinated hydrocarbons and chlorofluorocarbons in the manufacture of pharmaceuticals. High pressure carbon dioxide cylinders contain typically, in fire protection use, no more than 45kg but its thousands of uses around the globe require storage en-mass, customarily in its low pressure form. The largest of these bulk storage containers can contain over 200,000kg.

LOW PRESSURE BULK SYSTEMS

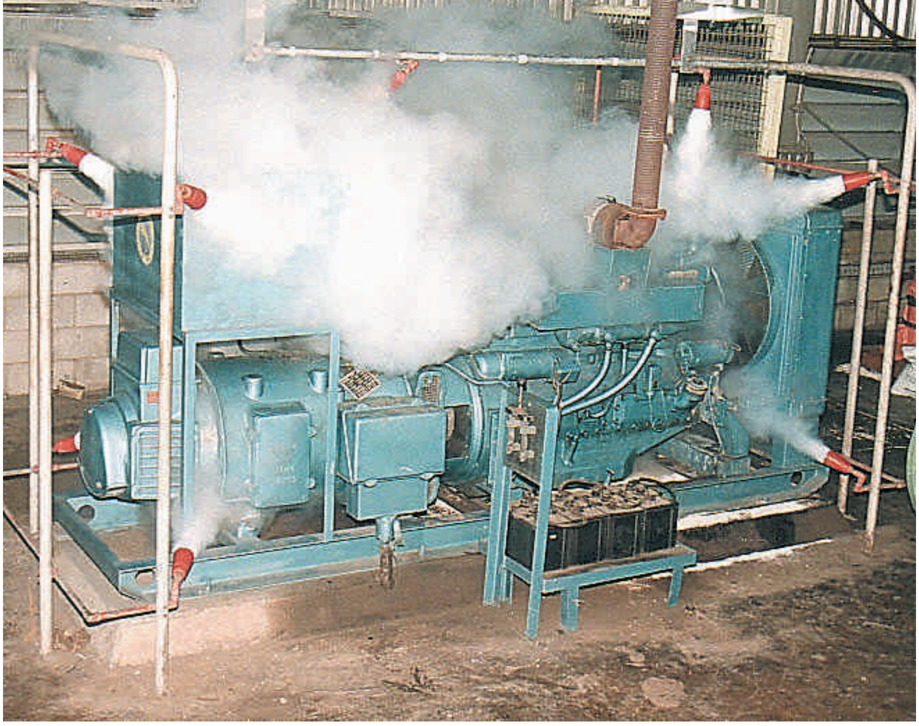
With the advent of carbon dioxide usage in fire protection in the 1920s, the Kidde high pressure cylinder became the benchmark mode of storage. Although a standard 100lb cylinder can protect a maximum volume of 50.4m^3 the economical Kidde cylinder of the day made manifolded cylinder banks cost effective thus protecting larger volumes. Also, being relatively small the cylinders are very flexible in locating within a building.

A natural progression to bulk tanks was inevitable however, when it came to protecting multiple risks requiring multiple tonnes of extinguishing agent. A single tank was used with sufficient carbon dioxide to protect all risks with a reserve supply as well, if necessary. A multi-branched pipe work system extended from the tank to each protected area with a directional valve to control the flow along each branch.

SPECIFIC BENEFITS OF LOW PRESSURE BULK SYSTEMS

The benefits have proved to be numerous.

- 28% less carbon dioxide is needed in Local Application systems. Low pressure storage contains a higher percentage in liquid form, which is required for this specialized application.
- The low pressure tank can be refilled in-situ whereas cylinders need to be disconnected and removed, then reinstalled after filling.
- The labour involved in installing manifolded cylinder banks is obviated and the maintenance of a single bulk tank versus a large bank of manifolded high pressure cylinders is substantially reduced
- Equivalent low pressure storage can require only half the floor area because the storage geometry is more efficient and the density of low pressure carbon dioxide is greater.



Pic courtesy of Pyrozone Manufacturing Pty Ltd

EMERGENCE OF MINI-BULK

The hole discovered in the Ozone Layer and the ensuing Montreal Protocol were the harbinger of a new paradigm in gaseous fire protection. The demise of the extinguishing agent Halon, in its forms of the day, was imminent. All the cards were up in the air. One thing was clear. There would be a resurgence in the use of carbon dioxide.

While international efforts were focused on finding a magical chemical that could do what Halon did, two companies redefined carbon dioxide. Ansul Preferred, from the US and Pyrozone Manufacturing P/L from Australia introduced the "Mini-bulk" concept to the market in the early 1990s. Patent application dates would suggest that Pyrozone was the first with this innovative approach.

Mini-bulk systems are based on low pressure carbon dioxide storage and provide modular ranges in capacities of about 155kg to 700kg. Mini-bulk tanks are manifolded together to provide the necessary capacity whereas the traditional bulk tank is selected with capacity to do the job (you need 48,500kg here's a 50,000kg tank).

PHILOSOPHICALLY DIFFERENT TO "TRADITIONAL SYSTEMS"

The **traditional bulk tank**'s strength is:
  On-site refilling
  Easily protect many areas

It's weakness:
  Limited flexibility with positioning

The **traditional high pressure cylinder**'s strength is:
  High flexibility with moving and locating in a building

It's weakness:
  Unwieldy in large numbers
  Service intensive
  Contents monitoring costly

The highly innovative mini-bulk concept combines the benefits of these two traditional storage methods without their weaknesses. To this, the Australian Pyrozone technology has incorporated electronic contents monitoring, adding no extra cost to a standard unit and providing 24/7 surveillance (read: "peace of mind") that sufficient agent is present to do the job.

A SPECIFIC BENEFIT IN HALON REPLACEMENT

Low pressure carbon dioxide has the lowest operating pressure of any gaseous extinguishing agent. Apart from reducing leak potential it provides a specific benefit in the ability to reuse existing halon pipe work in a retrofit situation. The 10 second discharge required for halon compared to the longer carbon dioxide discharge usually means there is sufficient pipe work capacity in a changeover to carbon dioxide. This is not the case for most 10 sec discharge agents. For the End User this results in less business disruption and much lower costs.

A UNIQUE ABILITY

If you are protecting many risks through directional valves from a central bank then it will often **not** be necessary to have in storage the sum of all risks' requirements. This can reduce costs significantly. It can still be possible however for each risk to have reserve protection on-line. Low pressure carbon dioxide provides unprecedented flexibility to do this, even with widely varying risk sizes, through a "timed discharge" facility. This is unavailable with any other gaseous extinguishing agent, even high pressure carbon dioxide!

This flexibility can be capitalized upon further by incorporating into the carbon dioxide central storage bank, the protection of risks whose location puts them beyond the reach of other systems.

DISTANCE

The protection of distant risks has to be approached with great care. Anyone who has attempted it will be aware that the smaller the risk, the closer it needs to be to the storage bank". An inherent difficulty where highly compressible fluids are rapidly discharged is freezing of fluid within the discharge lines. There are also basic requirements such as design concentration and rate-of-discharge specified in Fire Protection Standards that need to be achieved. The time delay between opening the valves and when liquid carbon dioxide starts to flow from the nozzles in the protected area is a factor in this.

The greatest distance to a risk known to have been achieved by a low pressure carbon dioxide system, and still meeting rate-of-discharge requirements, is 450m. The protected area of over 4,500m^3 was classed a deep-seated electrical risk. The ability to do this meant that all 12 risks within the building were able to be protected from a central bank, enabling great savings to be made with no compromise in protection.

The design of such a system required thermodynamic modeling to ensure there was enough energy in the carbon dioxide and the steel encasing it to prevent too great a pressure drop. An innovative technique was employed in the discharge. Valves were opened allowing the carbon dioxide to flow out, fill the pipe and commence to discharge into the protected area. At this point other mini-bulk units still at full pressure were opened, thus boosting pressure in the pipe and helping sustain the discharge. At the end of the discharge the pipe work was examined and no freezing of the carbon dioxide had occurred.

FUTURE

Mini-bulk low pressure carbon dioxide has redefined traditional high and low pressure carbon dioxide systems. It continues to stretch the boundaries with capabilities beyond any other gaseous agent. Used judiciously and carefully it will continue to save lives and livelihoods.

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Fixed fire pump

By Alex Playfair, Business Manager of SPP Pumps Ltd

DIESEL FIRE PUMP CONTROLLER
DANGER
AUTOMATIC MACHINERY LIABLE TO START WITHOUT WARNING
spp
PUMPS

Pic courtesy of SPP Pumps Ltd

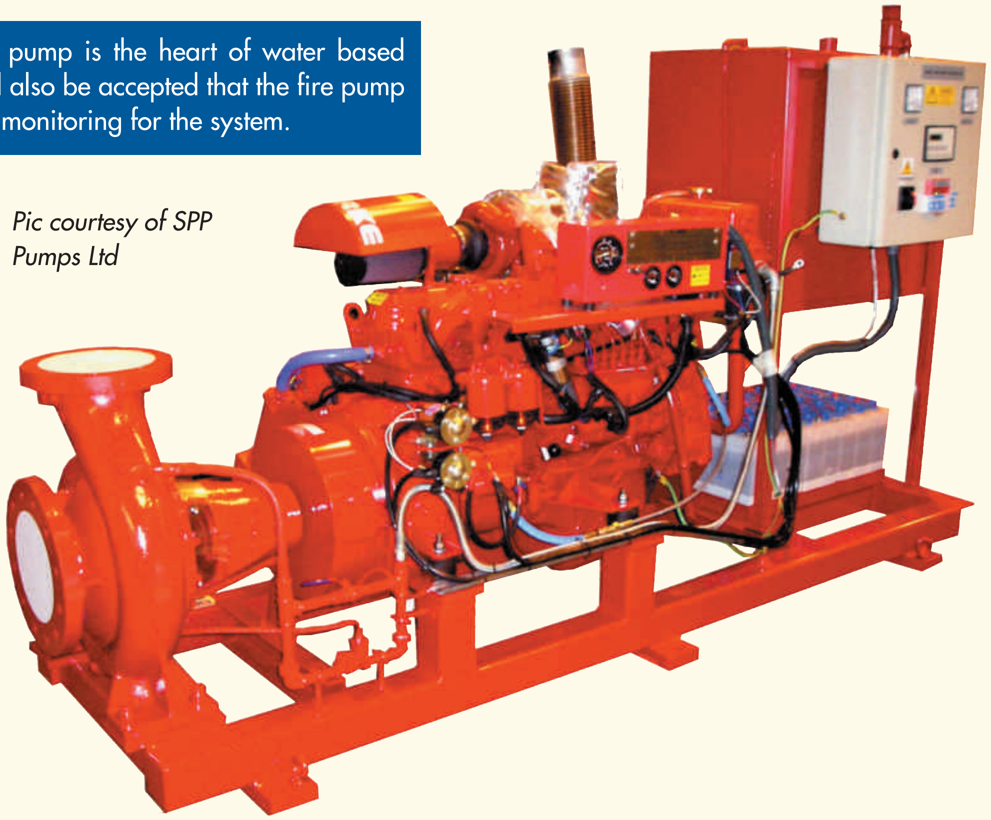
It is widely acknowledged that the fire pump is the heart of water based fixed fire protection systems but it should also be accepted that the fire pump controller provides the logic control and monitoring for the system.

The prime function of the controller is to monitor the status of the fire main and the power supply integrity. The controller will automatically initiate a start of the fire pump set upon receipt of a signal from the fire system that indicates that a fire has started. In most cases, this from a pressure switch, indicating that the pressure has dropped to a predetermined level in the fire water pipe work. Small pressure losses, usually caused by leaks are made up by a small pressure maintenance pump. When this pump or in some instances, pressure vessel can not re-establish the pressure loss in the fire main, then the pressure will continue to drop. This should be as a result of the system taking water for the fire application. The fire pump controller will immediately start the fire pump to satisfy any water requirements up to the maximum design demand required by the system. The pump runs out on its curve to the point where it satisfies the system demand and the static and friction loss in the fire system. The pump can also be initiated from a detector or even a manually actuated signal from an operative.

Most standard industrial starters and engine controllers satisfy the simple criteria of starting the unit but the fire system demands specific needs to guaranteed the reliability of a package that is designed to save lives and property.

In the case of European EN 12845 systems the electrically driven fire pump has a number of critical conditions that must be monitored to ensure reliable pump operation.

Pic courtesy of SPP Pumps Ltd



s and controllers

> *Pump on demand monitoring is needed to indicate that the pump has received its signal to start.*

The supply to the pump controller shall be solely for the use of the sprinkler pump set and separate from all other connections, ideally being taken from the input side of the main switch on the incoming supply to the premises, thus ensuring that any electrical fault within the installation will not deprive the sprinkler pump motor of its supply.

The monitoring of the power available to the motor on all three phases, pump on demand, pump running and start failure are all obligatory and provided by the fire pump controller. It is critical to constantly monitor the supply phases to ensure the integrity of the electrical supply. Pump on demand monitoring is needed to indicate that the pump has received its signal to start. The controller also monitors pump running and Start failure. All the monitored conditions are visually indicated in the pump room and at a permanently attended remote location. Pump running, power failure and start failure are also audibly indicated at the remotely monitored area.

On diesel engine driven units the use of any switch that prevents the engine starting automatically is monitored. This may be the main isolating switch on the panel or a selector switch turned to the manual start position.

spp PUMPS
ELECTRIC FIRE PUMP CONTROLLER
BREAK GLASS TO START ELECTRIC PUMP
BREAK GLASS PRESS HERE
Supply Healthy
Stop
A
DANGER
AUTOMATIC MACHINERY LIABLE TO START WITHOUT WARNING
SPRINKLER PUMP MOTOR SUPPLY - NOT TO BE SWITCHED OFF IN THE EVENT OF FIRE
spp PUMPS

Pic courtesy of SPP Pumps Ltd

The failure of the engine to start after it has run through its six-attempt cycle, pump running and any fault at the engine or controller must also be monitored. These signals must be indicated both locally at the panel and remotely at a manned station.

Diesel engine controllers incorporate dedicated battery chargers to maintain the charge on the engine starting batteries, the performance of the battery chargers and the charge level of the batteries are constantly monitored by the controller and alarmed as "Trouble at Engine or Controller" in the event of voltage levels falling to critically low conditions.

The controller also monitors the engine coolant temperature and lubrication oil pressure when the engine is in operation, any critical condition will be alarmed as "Trouble at engine or Controller", the engine will continue to run unless operator intervention occurs.

> *The failure of the engine to start after it has run through its six-attempt cycle, pump running and any fault at the engine or controller must also be monitored.*

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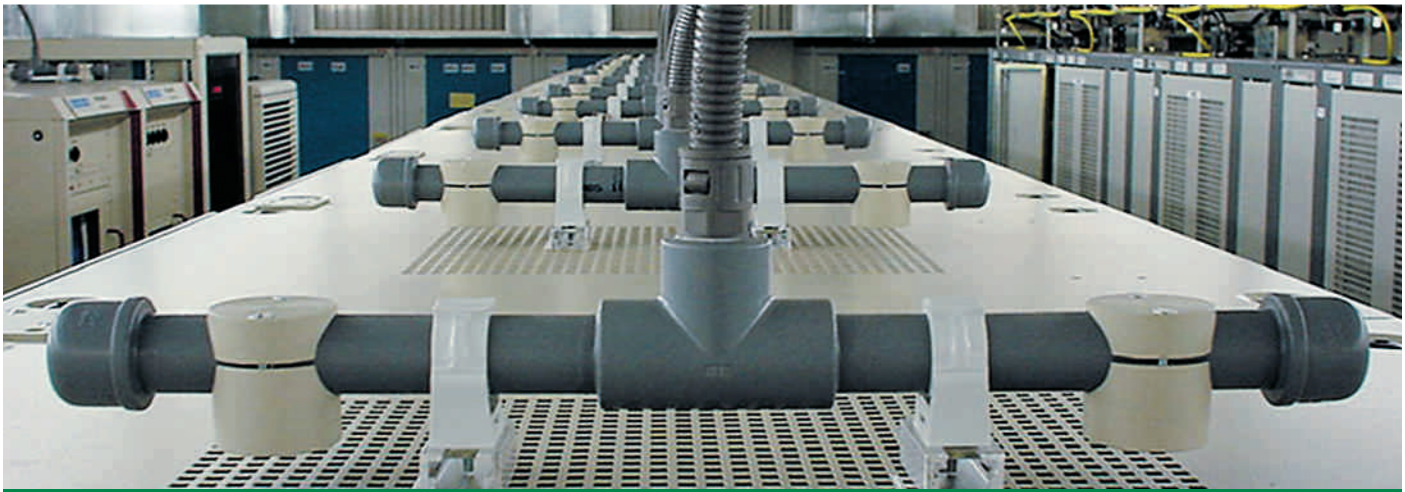

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Understanding Automatic Fire Detection

By Kai-Foo Chan of FM Global

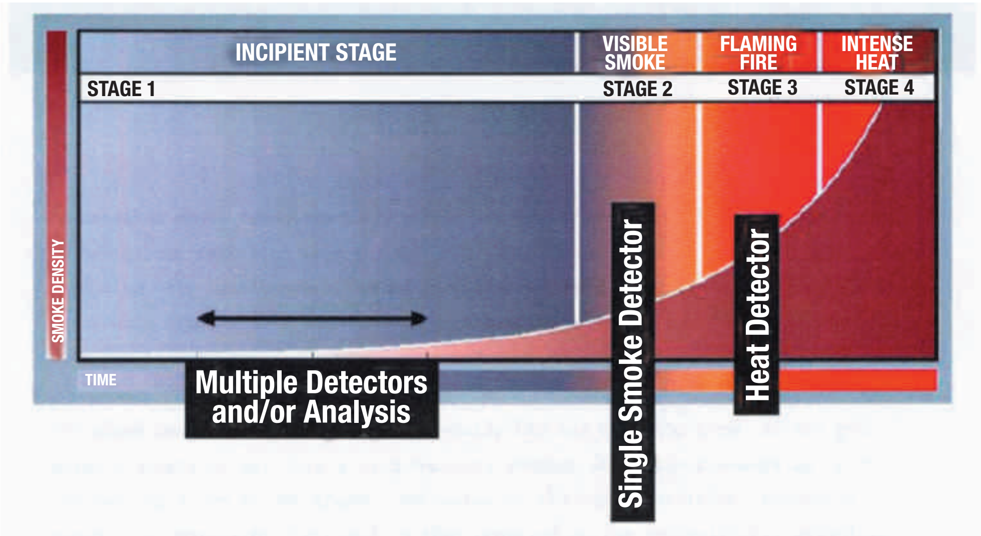
THE IMPORTANCE OF AUTOMATIC FIRE DETECTION

Human detection is the most advanced form of fire detection. However people may not always be present or respond properly when a fire begins. Early detection can have a huge impact on minimizing damage. In situations where smoke and water damage cannot be tolerated, detection is a must.

Automatic fire detection activate extinguishing systems or to initiate an alarm, or both. It will reduce the severity of a fire in an unsprinklered facility by notifying personnel of the fire before it has time to go out of control. Even where sprinklers are installed, detection plays an important role. Why wait until conditions get so bad that the protection system must operate? Sprinklers and other forms of fire protection are designed to control a fire and possibly extinguish it, but they will not eliminate the fire hazard or all of the damage that can result.

For critical locations such as clean room and telecommunications centers, incipient detection is counted on for early detection of conditions that can lead to fire. For example, a sampling air detector is about 1,000 times more sensitive than conventional spot detectors and can actually detect an overheated printed circuit board. It is important that fire detection equipment be selected properly, installed according to plans and initially tested. After that, regular testing and maintenance by qualified technicians will ensure reliability.

Automatic fire detectors have many applications in commercial, institutional, and industrial properties and for residential use. Although fire detectors can be a valuable part of a property's fire protection system, they are not considered a complete substitute for automatic sprinklers or other automatic extinguishing systems.



Fire detector responses during various fire growth stages

Damage in this sprinklered lab might have been prevented or minimized if an air-sampling system had been installed and there was a quick manual response. After this loss, an air-sampling system was installed and a second occurrence was prevented

SCIENCE OF THE HAZARD

The best way to fight a fire is with early detection and elimination of possible hazards, such as an overheating electrical component. Hazard elimination, however, is not always possible. A short circuit, a hot printed circuit board, a loose cable connection, a hot lighting ballast, and static discharge are all examples of fire hazards and ignition sources that cannot be entirely prevented. But, if the smoke particles are detected at the earliest stage, these conditions can be corrected before a fire develops. Incipient detection, such as air sampling, can detect smoke before it is visible. A modern sampling detector can be set to alarm at very low pre-fire levels and also can be interlocked with an extinguishing system at a conventional setting.

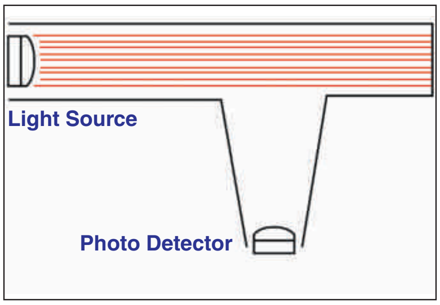
Conventional smoke detectors will respond when smoke concentration increases to a more noticeable level. Ionization type smoke detectors will respond more quickly to fires, but are slow to respond to a smoldering fire. For example, if there are flammable liquids present, an ionization detector or a flame detector might be a good choice. A photoelectric type smoke detector will work best where a smoldering fire might be expected, such as with plastics, furniture or electronics. Photoelectric detectors are becoming more common in industry. For some industries where a small amount of smoke can be tolerated, this type of detection may be adequate. In the early stage, a fire often can be doused with a portable extinguisher. Removing a power source or the source of ignition might even extinguish the fire. Heat detectors will detect the heat from a fire plume once the fire develops, but response time will depend on a number of factors, such as the type of detector, ambient temperature, the detector spacing, ceiling height, fire size and fire growth rate. For a steady growing fire (T-squared fire), plume width will be about 40 percent of the ceiling height. (Not all fires develop in this manner, however; those involving flammable liquids, for instance, are an exception.) If heat detectors are spaced properly, they should activate before sprinklers, allowing time for manual fire response at an earlier stage. This early response is especially important when detectors are interlocked with fire-protection or control systems, such as gaseous extinguishing systems, deluge or pre-action sprinkler systems, fire doors, fire dampers and equipment safety interlocks

Depending on fire growth rate, smoke detectors should respond more quickly than heat detectors, but heat detectors are not subject to the nuisance alarms that can sometimes occur with smoke detectors. Heat detectors will not respond to a fire in the smoldering stage.

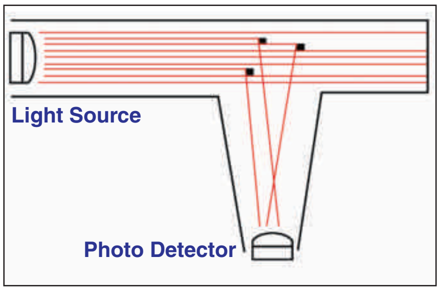
One must first decide the size of the fire that needs to be detected. A smaller fire will mean closer spacing. If fast-acting, flammable liquid-pool or spray fires are possible, flame detectors will probably be the best choice. In a high-ceiling area such as an atrium, stadium or museum, a beam detector might be best. We should always consider the type of hazard, building construction and environment in selecting the right type of detector.

LOSS EXPERIENCE

Many losses have occurred where detection was not installed but could have been beneficial. With other losses, people were present, yet it was a smoke detector that alerted the public fire service and helped minimize the damage. In some of the recent losses studied, smoke detectors went into alarm three to six minutes before sprinkler system activation. More modern, advanced detectors will probably perform even better. In one recent computer room fire, all of the ionization detectors went into alarm at the same time when the room was filled with heavy smoke. Smart photoelectric detectors would have been better suited for this application. A fire caused by a poor cable connection occurred in an accelerator lab a number of years ago, causing extensive damage to instrumentation and cables. An air-sampling system was installed afterward, and a similar occurrence was prevented. There have been numerous reports in recent years of air-sampling systems that detected overheated printed circuit boards at telecommunications centers.



Photoelectric detector not in alarm



Photoelectric detector in alarm

LOSS LESSON

The staff at an accelerator lab was setting up an experiment when an improperly connected ribbon cable overheated and resulted in a fire. A scientist working in the area noticed an odd smell but did not associate it with fire. The fire developed quickly, and the public fire service was finally called after thick smoke developed.

Sprinklers activated, preventing the fire from spreading to other areas of the lab, but they could not extinguish the fire. Fire fighters had some difficulty with the fire because of the heavy smoke and heat contained in the building. Before it was finally extinguished, the fire caused extensive damage to expensive lab equipment.

A sampling smoke detector system was installed after this incident.

OVERCOMING FALSE ALARMS

Nuisance alarms from non fire sources and false alarms caused by electrical faults can be a problem. Non fire sources include dust and smoke, such as that from cutting or welding, smoking and exhaust from forklift vehicles. In areas where smoke is commonly present, heat detectors or harsh environment smoke detectors that are available for dirty, dusty areas can be used. Some advanced detectors can distinguish smoke and dust from other aerosols. Intelligent detectors also can compensate for changing ambient conditions and for detectors that become dirty over time.

ENSURING SYSTEM RELIABILITY

If a system was properly designed, installed and tested by qualified fire-protection personnel, one can count on it. Periodic testing and maintenance will ensure reliability of the fire-detection system. Properly applied modern systems should respond quickly when called upon, and will minimize unwanted alarms.

THE COST OF AN ADVANCED SYSTEM

Installing a system correctly the first time can minimize cost. The hazards presented by an occupancy should be weighed against the cost, effectiveness and advanced features of various possible systems. For instance, a sampling system probably will be chosen for a telecommunications center. In a smaller computer room, smart photoelectric or laser detectors may do the job adequately at a lower cost. A more reliable, responsive system with self-diagnostics and immunity to nuisance alarms may be worth its weight in gold.

REDUCING RESPONSE TIME WITH CLOSER SPACING

Closer spacing means better response time, up to a point. There will be no benefit to spacing detectors within 20 percent of the ceiling height, because, at this distance, a detector should be in the fire plume. Trying to increase performance by reducing spacing means trying to detect a smaller fire in the same amount of time, or a larger fire in less time. Reducing spacing by half does not necessarily mean cutting response time by half. Many factors are involved in performance of heat detectors, for example. Detector sensitivity, ceiling height, ambient temperature, distance from the center of the fire plume and the fire itself all have an effect on performance.

Before calculating spacing, design goals must be established, such as the size of the fire to be detected, and how fast a firefighting response one can expect.

DECIDING BETWEEN IONIZATION AND PHOTOELECTRIC DETECTORS

If a fire is likely to start out smoldering, photoelectric detectors will respond much quicker. In a critical area such as a computer room, it would be prudent to replace any ionization detectors with photoelectric ones. More so, if the room is considered valuable. If there is very high airflow, install a high-sensitivity detector system.

THE EFFECT OF VENTILATION ON DETECTORS

There should be less space between detectors if the rate of airflow is too high. For example, spacing should be reduced by half for 15 air changes per hour. We should never install a detector too close to a ventilation outlet. We should always try mounting detectors close to an exhaust inlet.

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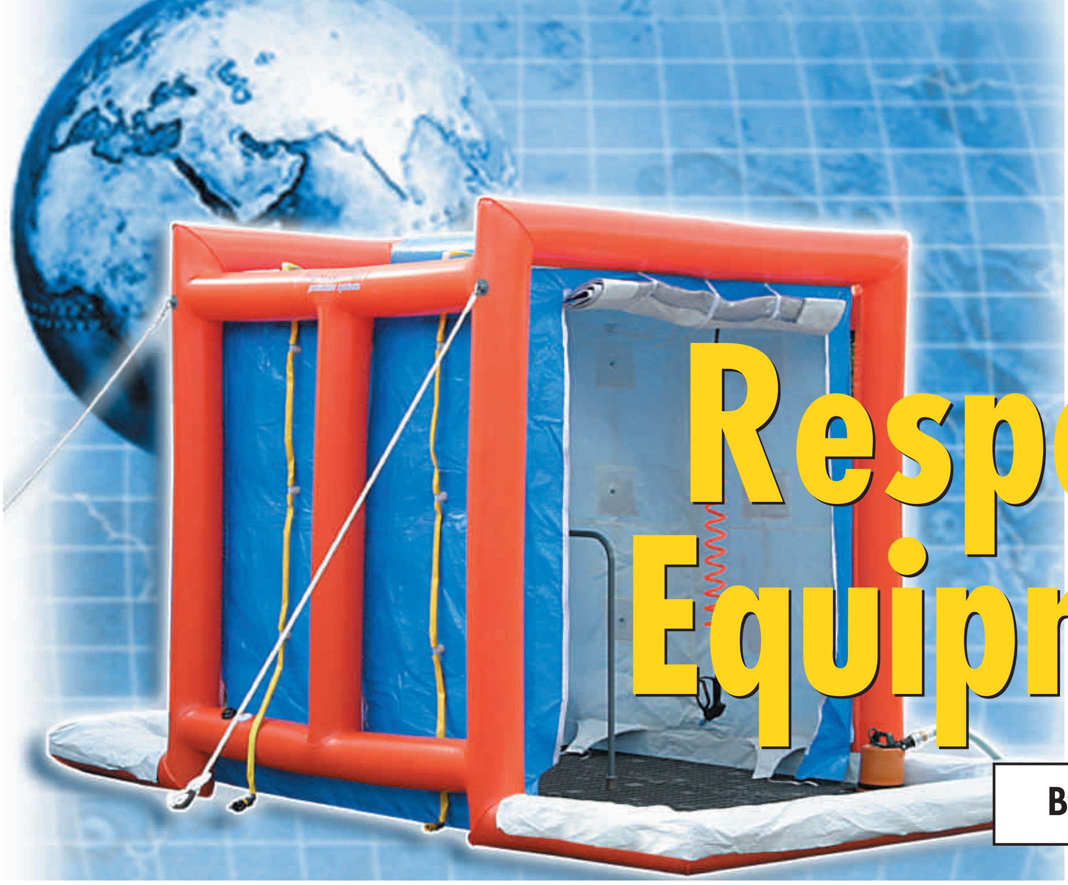
First Response Equipment

By James Brooks



First Response Unit, designed for the swiftest and most effective decontamination of suited personnel at the scene of an incident *Pic courtesy of PPS Ltd ©*

THE TERRORIST ATTACKS OF the last four years have marked a new era for many Nations. No longer can it be expected that the military actions taking place around the globe will ensure the safety of each nation's borders back on home soil.

The new frontlines of attack were first evident after the September 11th events with the inclusions of tighter border controls with more and more advanced equipment being used for surveillance and capture. Those products highlighted the physical requirements actually on the borders: The first lines of defence, but what about the lines of defence and clean up required much deeper inside the nations borders? The jobs and risks which in the past would be left to the military have now broadened and many more fire fighters and forces have to be prepared to deal with the much more realistic threat of a war in their own back yard. This threat has led to a much greater awareness and co-ordination with the World arena as a whole with information and technology sharing operating alongside revised emergency and rescue procedures. Perhaps more emphasis than ever before has been placed on training procedures and aftermath management. In this article we take a look at the increased quantity purchases of technologically advanced products and the actual use of certain products in the ongoing fight with disaster management.

HAZMAT

Probably every nation's major concern is that of the chemical warfare – dirty bomb - threat and it is for such circumstances that many fire fighting personnel now have both special training and protective equipment. Hazmat – or NBC – suits have been in continuous development stages since the early days of nuclear explorative work and today suits are manufactured to the highest levels and from materials impervious to over 200 different types of toxins. Most will have a five year shelf life and all have the capability of multi use if correctly washed and sanitized. The reduced time for the user to get 'suited up' and increased use-ability and comfort from the suits has led to an increase in the use of such products but it has most definitely been the direct link to terrorist threats around the World.

In the U.K. the recent London bombings saw such suits in use throughout the immediate aftermath and then well into the clear up operation as the standard precautionary procedure for such a situation.

Of course NBC suits are not new to the fire services as hazmat/toxic spill operations have been well within the operating schedule for all fire services for some years. However the use of the NBC suit whilst performing extraordinary

> *In the U.K. the recent London bombings saw such suits in use throughout the immediate aftermath and then well into the clear up operation as the standard precautionary procedure for such a situation.*

First Response Equipment

CPC Suit *Pic courtesy of Trelleborg Protective Products AB*

search and rescue operations such as underground search and rescue is new and the training for such carries a much greater emphasis as the potential for further threat action whilst carrying out the search and rescue is ever present. The latest generation of suits allow the user much greater vision and freedom of movement as technology on air tight seals and fasteners have improved along with the overall material compounds used.

With the use of such suits comes the obvious use of hazmat detection equipment. These two products almost go hand in hand as with out one, the other would be an obtrusive unnecessary. Of such haz mat detectors there are many in the market and have been many for some years as such industry standards require. Again over the last four years the growth in sales of such products has soared as the necessity to be pre-warned of any such attack and the level of such threats has risen. These products again require some specialist training and cover the range from Nuclear, Biological and chemical agents.

FIRST RESPONDER

Within the suits the user will still be able to use his/her more traditional equipment but even the equipment which only five years ago was cutting edge is now being replaced with more up to date models. Radio communication between first responders, their operating chief and the overall commanding officer is by far the quickest and easiest method of relaying information from within the operation to the outside World. VOX communications systems are now being used to great effect with the capabilities to tie many users to one system and also under closed RF. Linked in to the overall communications packages are the standard and thermal imaging cameras which again over the last five years the industry has seen this market on a sales percentage grow to over seven thousand camera sales per annum and on a technology based angle the products have evolved to such a point that the end user can now specify from over one hundred different models. Working together with strong and reliable wireless transmission units this camera and radio package can offer the first glimpse of any major incident where restricted access, low or no light would hamper normal recovery operations.

With the improved comfort and weight reductions seen on most fire helmets over the last ten years the incorporation of 'other' valuable tools such as the radio comms and some form of camera system has lent itself to the fire firefighter's role being far more encompassing than ever before. He/she is the eyes and ears and nose for many.

ACTIVE FIRST AID/MOBILE RESPONSE

Away from the actual incident the requirement for mobile and portable medical centres has been highlighted as a necessity by the services offering first aid and more where the situation and location of such would restrict casualties making the distance to hospital. These mobile covers (shelters) now range from the simple and standard covers to the more advanced inflatable shelters used as field hospitals. Along with the first aid shelters, modern technology developed the de contamination shelters which again have mirrored the sales growth of the NBC suit similar to the detection kits and have allowed team leaders and commanders of incidents a much greater flexibility with how and where they run operations. What once was a fixed and rigid playing field can now be folded away and moved anywhere it is required and all this by the use of increased helicopter numbers and amphibious machinery.

The industry has seen that the use of technologically advanced techniques/products and their implementation with existing products/services was already beyond it's infancy before the up surge in sales following September 11th. Being thrown head first into such catastrophes merely sharpens and quickens the responses of all technology based companies to develop at a much faster pace and indeed the fire service has played a crucial role in this technology integration as it is the actual user with real time feed back and useful insights.

INDUSTRY RESPONSE

It is not just the fire services which have had to up scale their arsenal of protective equipment, corporate and non corporate industry had to act and 'be seen to act' in providing safety for it's employee's. During the last four years the sales of personal escape hoods and equipment which aid escape have grown 45% over pre-September 11th 2001 figures. Similar sales growths in Chemical Detection Paper badges which can indicate the early release of certain hazardous materials have been seen. In fact products such as these are in use both in industry and by the first responder teams as they are an accurate detector device.

The question is: Are these figures and other growth areas for such products simply highlighting industry as wanting to be seen to be acting in the correct manner or is there a real threat to us in our place of work?

> Over the past five years the World has grown accustomed to witnessing through many different media the fire service utilizing all of the products mentioned here and more, whether in training exercises or for real the outcome will always be the same: All nations must be ready and equipped for any such incident.

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Will a "Level A" suit always get the job done?

By John F. Eklund
Trelleborg Protective Products AB, Sweden

Pic courtesy of Trelleborg Protective Products AB

A reflection on the use of chemical protective suits from the application point of view

CHEMICAL PROTECTIVE SUITS (CPS) as we know them today owe their origins to the results of NBC development programs for military use. These types of NBC protective suits have been further developed and modified so as to be suitable for use in civilian applications by first responders, fire and rescue services, civil defence personnel, anti terrorist teams, police and other governmental agencies as well as within the industry.

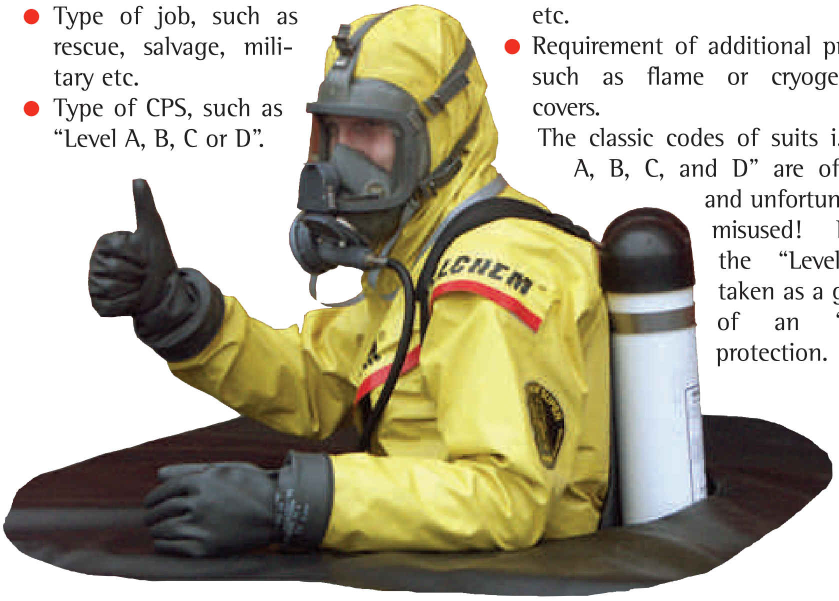
Today the civil versions are also widely used by the military or other defence related services for the purpose of bomb disposal, demilitarization programs, including the disarming of weapons of mass destruction, anti terrorist programs, refuelling of rockets and similar tasks.

The main purpose of chemical protective clothing (CPC) is to protect the wearer from direct skin contact with hazardous substances in their various forms.

It is a complex task to select a CPS even if we today are supported in this process by various standards, such as the American NFPA 1991 and the European EN 943. However there are many other factors than standards to bear in mind in a selecting process – among others:

- Regulations, directives and standards (to be considered).
- Level of protection factor (PF) (to be established).
- Type of job, such as rescue, salvage, military etc.
- Type of CPS, such as "Level A, B, C or D".
- Totally encapsulated (coverall) or non encapsulated designs of CPS.
- Reusable or disposable/limited use type of CPS.
- SCBA on inside or on outside of the CPS.
- Breathing air supply by external source or by SCBA only.
- Environmental impact, such as temperature i.e. risk of heat stress or frost bite, confined space entries etc.
- Requirement of additional protection, such as flame or cryogenic over covers.

The classic codes of suits i.e. "Level A, B, C, and D" are often used and unfortunately also misused! Especially the "Level A" is taken as a guarantee of an "optimal" protection.



Pic courtesy of Trelleborg Protective Products AB

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THE DEFINITION OF THE "LEVEL A" CODE

"Level A protection is required when the greatest potential for exposure to hazards exists, and when the greatest level of skin, respiratory, and eye protection is required. Examples of Level A clothing and equipment include positive-pressure, full face-piece self contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA, totally encapsulated chemical- and vapour-protective suit, inner and outer chemical-resistant gloves and boots."

Will such a "Level A" suit always get the job done? The answer must be no! This even if the "Level A" type of CPS i.e. totally encapsulated type of suits from the theory and some times also from standards point of view are "defined/classified" as offering the "best" protection.

There are many applications where a "Level A" (totally encapsulated) CPS might even jeopardise the safety of the operator. Example of such an application is confined space entries. Other disadvantages of a "Level A" suit are risk for claustrophobia, high breathing air consumption and limited visibility.

Is there an alternative to the "Level A" suit? Yes, there is! It is an advanced type of the "Level B" type of CPS. The main design difference between a "Level A" and a "Level B" CPS is that the SCBA is carried on the outside of a "Level B" suit, preventing the suit from "ballooning", which a "Level A" suit will always do. A "Level B" CPS is also more snugly cut/designed to minimise the balloon effect. Due to this, a "Level B" type of suit is ideal for among others confined space entries and it offers superior visibility compared to a "Level A" suit.

From a liquid- and gas-tightness point of view, an advanced "Level B" CPS offers the same level of PF as a "Level A" suit.

THE DEFINITION OF THE "LEVEL B" CODE

"Level B protection is required under circumstances requiring the highest level of respiratory protection, with lesser level of skin protection. At most abandoned outdoor hazardous waste sites, ambient atmospheric vapors or gas levels have not approached sufficiently high concentrations to warrant level A protection – Level B protection is often adequate. Examples of Level B protection include positive-pressure, full face-piece self contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA, inner and outer chemical-resistant gloves, face shield, hooded chemical resistant clothing, coveralls, and outer chemical-resistant boots."

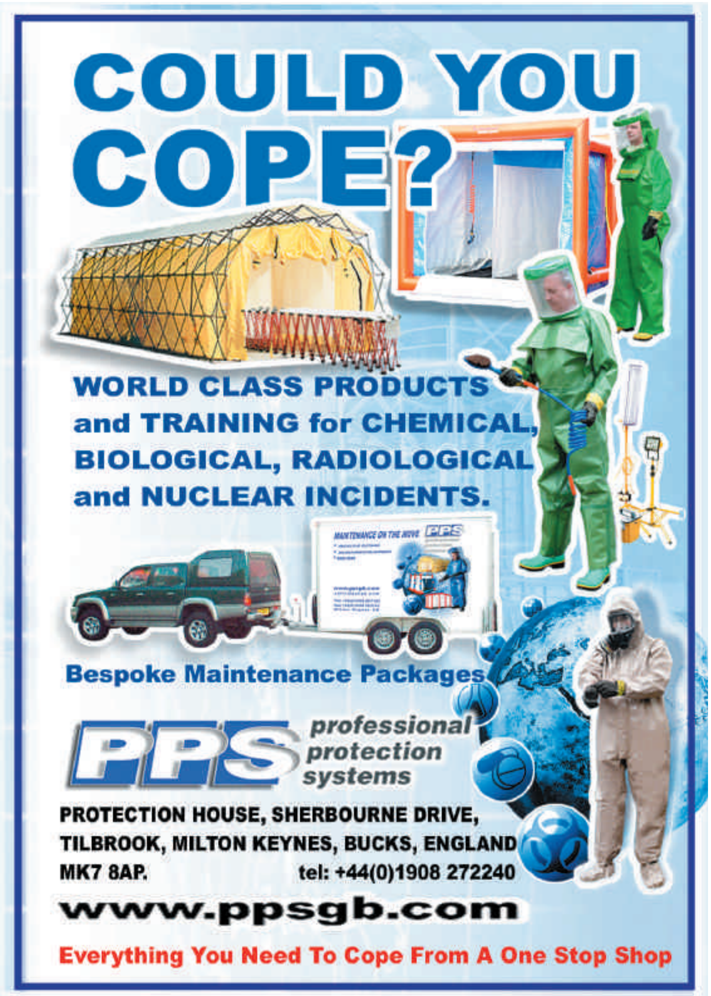
The impacts of the "Level A, B, C and D" codes vary from region to region. For example in Scandinavia the code is not recognised and an advanced "Level B" type of suit, i.e. with the SCBA on outside, is the predominant type of CPS in use. It is considered as offering the optimal protection also for application within the fire and rescue services, defence agencies and industry. In America the code is in daily use. There might be a difference of opinion between Europe and America when it comes to the "CPS code"; however hazardous chemicals are equally hazardous in Europe as in America.

The complexity of the different standards and types of applications requires a profound and comprehensive evaluation process before a decision is made on the selection of your next generation of chemical protective clothing. Even the word clothing in this concept is perhaps slightly inadequate. Your decision will not be about a piece of clothing. It will be about a life support system – the last link in your chain of personal protective equipment. And someone's life could depend on it.

Then – what conclusion can we draw from this? It can only be this. That each and every one of us has to take the responsibility for the consequences of our own actions and always keep the work task/application in mind!

John F. Eklund (b. 1951) is Senior Sales and Product Manager of the Trelleborg Protective Products AB, a company within the Swedish international industrial group Trelleborg AB.

John is a highly qualified engineer with more than 22 years of experience in managing the development, engineering, production, marketing and sales of advanced chemical protective clothing (CPC) and other personal protective equipment (PPE).



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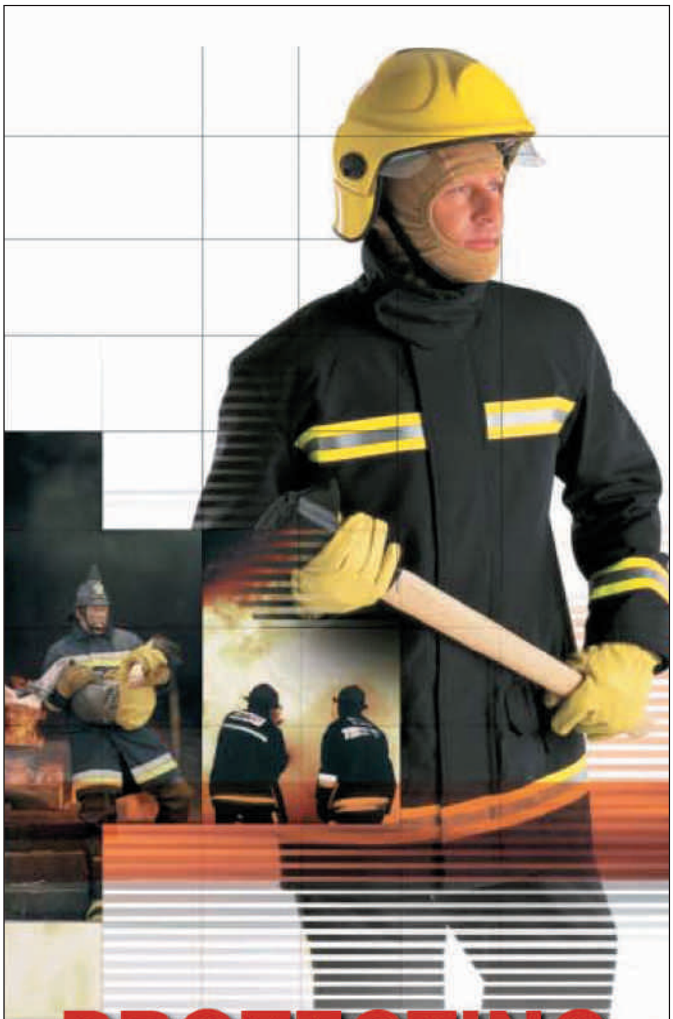

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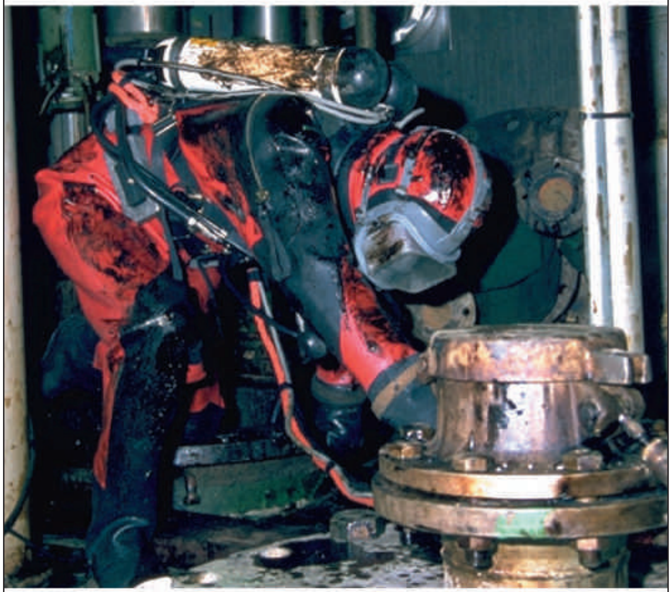

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TYCO UNVEILS NEW i3 INERT GAS SYSTEM

Tyco Fire and Security has unveiled Hygood i3, its latest inert gas fire suppression system for total flooding applications, that is non-toxic, non-corrosive and odour-free, is zero ozone depleting and has zero global warming potential. Designed to protect computer suites, telecommunications facilities and archive stores, it is also expected to be used extensively to safeguard petrochemical and power generation facilities, offshore oil and gas production facilities and gas turbines. In fact, i3 is claimed to be effective for virtually all combustible material and flammable liquid fires.

Among its many benefits, i3 is fast acting and has a low life-cycle cost; it is electrically non-conductive and has no breakdown products or residue, so there is no risk of damage to sensitive equipment, plus i3 has zero impact on the environment. Significantly, where space is at a premium, i3 has a smaller footprint than traditional lower-pressure inert gas technology. To add to its appeal, it is verified by the LPC [Loss Prevention Council], has VDS [Vertrauen Duerch Sicherheit] approval – a German standard for reliability in safety and security matters – and is recognised by many other regulatory bodies around the world.

Hygood i3 is a pure 50:50 mixture of two naturally occurring gases – Argon and Nitrogen – and so neither adds to the environment nor takes anything away. As it has no detrimental environmental impact whatsoever it is likely to appeal to organisations where specifying a non-chemical suppressant is of paramount importance, or where environmental concerns are high on the corporate agenda. The blended gases have a similar density to air, so the mixture retains its concentration when discharged for far longer than the now outlawed Halon 1301 chemical suppressant.

It extinguishes a fire on discharge by reducing the ambient concentration level of oxygen to between 10 percent and 14 percent. This is below the concentration level necessary to support combustion, but sufficient to support life for a short period. Hence, i3 is ideal for use in occupied rooms or enclosures. Its appeal for use in occupied spaces is further enhanced by its being an invisible gas that does not obscure vision.

Hygood i3 is stored in high-pressure steel containers with an operating pressure of 300bar. Installations comprise one or more containers connected to a system of pipework and rapid-discharge nozzles; fully engineered solutions designed using i3 flow calculation software. Cylinders can be stored remote from the area being protected and a bank of cylinders can be used to safeguard more than a single room or enclosure.

This latest addition to Tyco Fire and Security's fire safety offering confirms the company's status as a full solutions provider. Its unveiling follows shortly after the launch of the company's Sapphire fluid-based system that uses new, sustainable, long-term technology that satisfies all of current and foreseeable regulations; a system that has an insignificant global warming potential, the lowest level of design concentration and the highest safety margin of any viable Halon 1301 or chemical alternative.

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Aspects of glass and performance-based design

By Mike Wood of Pilkington Glass

Pic courtesy of Pilkington Glass

IT IS BECOMING MUCH more commonplace to see performance-based design approaches being used where the local building regulations are considered to be too prescriptive and inflexible to accommodate the design issues arising from modern large construction projects.

This particularly applies to commercial projects with an international flavour. A modern high rise or multi-functional sparkling glass palace in Hong Kong looks very similar to one in Shanghai, Sydney, New York or Mumbai. The function of the building is determined by its type, not its location. And when it comes to fire protection design, then surely common principles apply. Certainly the fundamental way that materials and systems react to fire is determined far more by their basic characteristics than by either latitude or longitude.

So, I think it's important, and certainly valid given the potentially catastrophic risk of fire, to shine more of a spotlight on aspects of performance-based design.

We need to ask some questions of the designers and remind them of some key considerations where material behaviour in fire is concerned. Big buildings, lives, and tens of millions of dollars in contents and real estate may well be at stake. Glass offers so many functional benefits in buildings and provides such a distinctive aspect to design. It also can exert a major influence should fire break out. It is therefore useful to take glass as an example to illustrate some of the aspects that arise from performance-based design.

Fire design models, such as that employed in the Euro design code, fundamentally rely on assumptions of when the glass in windows breaks, and to what extent. The predicted temperature-time scenario of the design fire is therefore inextricably linked with glass behaviour. It seems an obvious conclusion that the glass technologist should be closely involved in the development of models of fire development. I'm not confident that this is so far the case.

The nature and structure of glass means that fracture under thermal stress is fundamentally unpredictable. Crack initiation, the direction of crack propagation and the resultant cracking pattern cannot be calculated. There is no validated computer model that can provide a ready made cast iron prediction of the point and extent of failure. The failure of glass is governed by random effects and prediction of failure is therefore inherently uncertain. Circumstances and handling history, before and after glazing, also imposes a further degree of uncertainty.

For standard annealed flat glass products integrity failure due to multiple cracking occurs within the early minutes under fire conditions. A rise of temperature as little as 80ºC may be sufficient to cause cracking but there is a distinct probability of failure over a range of temperatures rather than at critical limit temperatures. Pane size, framing conditions, and critically surface and edge quality are all important factors in determining how the glass will react when exposed to fire. Double glazing may delay the onset of failure,

> *A rise of temperature as little as 80°C may be sufficient to cause cracking but there is a distinct probability of failure over a range of temperatures rather than at critical limit temperatures.*

Pic courtesy of Pilkington Glass

dependent on circumstances, but this is generally not significant in terms of integrity fire resistance.

Toughened soda lime glass, although significantly stronger than annealed glass, is also susceptible to unpredictable failure under thermal stress. A temperature difference as little as 200ºC may be sufficient to cause failure. And if failure does occur then the glass pane disintegrates into a pile of pieces. As with annealed glass, there is a probability distribution of possible failure over a temperature range. There is no progressive cracking with toughened glass and no warning. Failure under thermal stress or shock is catastrophic and unpredictable. One minute it is there, the next maybe not. Glass specialists know how to minimise this risk through careful handling, particular attention to the production process, and specific details in the framing but it is difficult to ensure that the possibility of failure is entirely eliminated. Few producers have the necessary experience.

To counter the uncertainty and fierceness of fire, glass technologists have worked assiduously to provide reliable fire-resistant glazing technologies. These are now well established with demonstrable records of performance. Dependable protection against fire requires such tried and tested fire-resistant glazed solutions specifically designed to do the job.

Fire-resistant glass products are available that can provide protection in terms of either "integrity" (which means that the glass acts as a barrier to prevent fire movement) or "integrity and insulation" (providing both a physical and thermal barrier to fire). There are now a number of different glass types available in each performance category, based on a number of different aspects of glass technology. Details in each case need to be sought from the specialist manufacturers.

It would be a mistake to assume that all fire-resistant glass products are alike. They are not. In fact there can be significant differences in important points of detail, even if the glazings may have at face value the same performance classification. Above all, what is achievable with one fire-resistant glass may not be achievable with another. Tested approvals apply to particular configurations, glazing sizes, aspect ratios, material combinations, particular framed systems and applications. Some have been far more extensively tested than others.

Such differences are important in a risk-based approach to design. It is important not to be misled by the superficial label "pyro" attached to different products. It does not automatically mean an equivalent level of performance, especially in terms of robustness and resilience under real fire conditions. Careful consideration should be given to each product type and its underlying technology to identify its capabilities. Differences in performance, the range of available systems, the weight of test evidence, product response to fire, reliability and consistency all need to be evaluated in a performance-based approach to fire design.

Pilkington has developed a high performance fire-resistant glass technology based on a special inorganic interlayer laminated with annealed glass sheets in a sandwich structure (as used in Pilkington Pyrostop^{TM} and Pyrodur^{TM}). Such technology is robust, reliable and flexible under fire conditions. It provides both integrity and integrity with insulation over a wide range of temperatures, exposure conditions and times (for example, up to standard test times of 180 minutes in appropriate frames), tested in various systems and applications (for example, including glass floors). The function of the special interlayer can be guaranteed in case of fire: it turns opaque, absorbs heat and intumesces to give a stable foam structure. The interlayer cuts down radiant heat to safe tolerable levels, insulates and holds the whole structure together as a resilient barrier against fire. Tough performance against the impact of the US hose stream test can even be demonstrated.

In some performance-based designs the practice of using toughened glass in conjunction with window sprinklers has been adopted on a presumption of a fire

Pic courtesy of Pilkington Glass

resistant performance equivalent to that of fire-resistant glazed assemblies. The technologies and performance limits, however, are far from being equivalent. And the superficial comparison of performance is not on a like for like tested basis of the proprietary assemblies as installed. The testing pedigree of the two system types is dramatically different. That's fine, provided that the different levels of risk implicit in the different approaches are also understood, acknowledged and made clear.

The sprinklered toughened glass assembly should be tested as a propriety system. Published research results on the principle should not be relied upon as an alternative to rigorous testing of the proposed assembly. Such research, for example, may only refer to single panes under idealistic conditions, with controlled water flow and even coverage, and not to multiple panes in realistic glazed assemblies relevant to the installed application.

In contrast, Pilkington Pyrostop^{TM} and Pyrodur^{TM}, for example, have been perfected over more than 25 years of repeated testing around the world in different places, at different times, and in many different types of glazed system designs and assemblies. There is a depth of test evidence to different national standards, supported by post mortem real fire experience. They have also been put to the test in large scale non-standard assemblies. I am not aware that the same level of scrutiny has been applied to sprinklered toughened glass assemblies.

The risk of failure of sprinklered toughened glass elements is far higher that that of proven fire-resistant glazed assemblies. Performance is more unpredictable and dependent on events. If there is a likelihood of water impingement on hot glass at some stage, then it is absolutely critical that the coverage is even and continuous over the surface of the glass from the beginning of a fire. Can these ideal conditions be achieved in practical glazed situations, where fittings, furnishings, mullions and transoms, in particular, can easily prevent uniform water coverage? There has to be a measure of doubt that this really can be the case. Standard toughened glass, because of its nature, is critically sensitive to uneven thermal stress. Building users may naturally not be aware of the sensitivity of such glazings to local fire sources. They may place furniture in front of the glazing or install fabric blinds that in effect supply a potential fire load exactly where the risk is greatest, that is, directly next to the glass surface.

Pic courtesy of Pilkington Glass

An approach based on fire-resistant glazed assemblies therefore comes with a totally different – much lower – risk level compared with sprinklered toughened glass assemblies. Is this recognised? I suspect not. Is it important? Critically so, I think, especially if the design comes with a certain assurance of reliable fire resistance performance. The question is how the performance-based design approach can bring out and quantify the different risk levels inherent in different design solutions using different systems. How can different levels of risk be valued in terms of life safety and building protection?

The need for high performance fire protection in the built environment is just as critical as in the past. Perhaps more so, given modern designs. Certainly new challenges are being set. Our cities are becoming more diverse and increasingly congested; our buildings and designs are becoming more innovative and complex. Life safety is not the only objective. Once the occupants have safely escaped, then the building structure needs to be protected against fire so that firefighters can safely go about their job, to minimise the costs of fire in the building of origin, and to reduce the impact of fire on the environment and the surrounding community.

There certainly is a role for performance-based design. It is, perhaps, not yet the finished article, but rather work in progress. Design with a greater emphasis on risk assessment and expert judgment means that we have to look at our products and systems in a different way, with much more of a focus on the underlying technologies and evaluation of what the implications may be for reliability and consistency under real fire conditions. Testing is important, the more the better, but it should be taken as one element of a more wide ranging evaluation of aspects. The fire protection designer needs pertinent data on products and information on product technologies. Industry is well capable of providing that support, but communication between the two needs to be better.

Taking glass as an important example, the necessary key knowledge on products, technologies and systems largely rests with the glass technologists. My plea is therefore that they be consulted and brought into the fire protection design process as early as possible. Successful progress in performance-based design, in terms of dependable fire resistance performance of the building, critically depends upon it.

Mike Wood is a glass specialist of more than thirty years' experience and currently chairs a number of representative UK fire protection groups which includes the Fire Resistant Glazing Group of the Glass and Glazing Federation, the Fire Safety Development Group, and the strategy committee of the Passive Fire Protection Federation.

A CR-ROM version of Pilkington's SPECIFIRE guide to fire-resistant glazed systems, which outlines the options for different performance and framing situations, is also available on request (tel: +44 (0)1744 69 2000).

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From Angus Fire, the company that *invented* covered fire hose

Fire hose is perhaps the most important piece of equipment carried on a fire appliance. It is the fire fighter's lifeline. If it fails, your life could be in danger. That's why it's so important to use the best, and don't all fire fighters deserve the best? As the world's first ever covered fire hose, Angus Duraline is the benchmark hose that sets the standard other hose manufacturers have to meet. Many have tried, but none have succeeded. Their imitations look like Duraline, and their names even sound like Duraline. But remember, if it isn't Angus, it can't be Duraline! Here are forty reasons, one for each year since Duraline was introduced, why the original covered fire hose is still the best.

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5 Duraline is provided with top quality couplings from recognised and traceable suppliers. Quality and safety are never compromised over price

6 Duraline is widely used in non-fire fighting applications such as flood relief, animal rescue, and river rescue when used with inflation kits

7 Duraline is believed to be as near to a non-maintenance hose as the world is ever likely to get

8 Duraline is the only hose with vacuum-sealed pinholes that prevent water from reaching the jacket. It is the jacket that gives the hose its strength

9 Duraline was the first Type 3 covered fire hose to be awarded a British Standard Kitemark under BS 6391. It remains one of only two international products to have achieved this

10 Used in every imaginable environment around the world, from arid desert to arctic tundra, Duraline has a proven track-record of long service life

11 Duraline is used by over 500 fire departments and 200 oil and chemical companies world wide

12 Easy-to-use hose repair systems approved by Angus ensure that damaged hose can be returned to service quickly and safely

13 Duraline has unbeatable heat resistance as shown by its outstanding performance in the BS 6391 Hot Cube Test

14 Every length of Duraline is 100% factory inspected and tested

15 Duraline has an all polyamide jacket that provides the best rubber-to-textile adhesion that modern technology can achieve, surpassing the cheaper polyester alternatives

16 Manufactured in Yorkshire, Duraline is the fire hose wi' nowt taken out!

17 Duraline is the number one hose in the British Fire Service. It has also been standard equipment in the UK Ministry of Defence Fire Service for over 25 years

18 Duraline can be wiped down after use and returned to service immediately without the need for drying

19 Thousands of tiny vacuum-sealed pinholes in Duraline protect the jacket from attack by aggressive chemicals

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21 Duraline has a durable cover that is exceptionally resistant to abrasion

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24 Duraline is flexible and resistant to slippage

25 Duraline has a very high burst pressure. For example, the burst pressure of 2 inch diameter Duraline is 50 bar

26 Duraline has a wide range of international approvals including BSI Kitemark, Underwriters Laboratories, UK Maritime and Coastguard Agency, Lloyd's Register and Det Norske Veritas

27 Duraline is used by zoos in monkey cages because it lasts for such a long time

28 The construction of Duraline prevents delamination or layers of the hose peeling away from one another

29 Duraline is stocked in over forty countries world wide

30 Duraline is tough and robust with excellent resistance to impact damage

31 Duraline is asked for by name so often that it has become the generic name for covered fire hose

32 Duraline has special additives in its jacket that give it unrivalled resistance to attack by ozone gas in the atmosphere, which can lead to surface cracks and reduced flexibility in cheaper hoses

33 After-sales service for Duraline is provided by a global network of distributors specially trained by Angus

34 Duraline is highly resistant to weathering by ultra violet light

35 Duraline has a special rib configuration on its cover that makes it easy to make a tight coil

36 Angus has many testimonials by fire fighters describing the outstanding performance of Duraline at actual fire incidents

37 Duraline is available in the widest range of diameters, lengths and colours

38 Duraline users have access to the world's number one source of technical help and advice on covered fire hose technology

39 Duraline offers the best value for money, remaining in operational service many years after cheaper imitation products have proven to be false economies

40 Angus maintains a continuous programme of product improvement with Duraline that has maintained its position at the leading edge of hose technology for forty years.

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The Future of Suppression Systems is here

Pic courtesy of Tyco Fire & Security

ANDREW SHINER IS DIRECTOR, Marketing Europe, Middle East & Africa for Tyco Fire & Security's Fire Suppression Strategic Business Unit. Here he reviews the various Halon alternatives that have come onto the market, and argues that the search for a replacement is at an end.

Halon 1301 was used around the world to protect what, with the arrival of the telecommunications and computer age, came to be known as business critical assets – manned telecommunications centres and computer suites, upon which many corporations rely for their very existence. It was also used extensively to safeguard art galleries, museums and document archives, as discharge of the Halon gas resulted in no damage being caused to the sometimes-irreplaceable works of art.

It was a first rate fire suppressant. Unfortunately, the same could not be claimed for its environmental credentials. Halon 1301 had ozone depletion potential, global warming potential and an atmospheric lifetime that was wholly unacceptable.

So the demise of Halon 1301, following the signing of the Montreal Protocol on Substances that Deplete the Ozone Layer back in the early 1990s, had chemists around the world devoting thousands of man-hours in the search for a sustainable, environmentally acceptable and long-term alternative. Their aim was to develop a suppressant that, while satisfying the needs of the fire industry, would allay the real and vociferous concerns of environmentalists.

To cite just one recent example that puts the challenge into sharp perspective, as recently as September 2004, some 25,000 books were destroyed and a further 40,000 were damaged by smoke and water in a fire that occurred in the Duchess Anna Amalia Library housed in a 16th-centry rococo-style palace in Weimar, Germany. Christina Weiss, Germany's Culture Minister, understandably called the fire "a national culture catastrophe and a great loss for world heritage."

> *As recently as September 2004, some 25,000 books were destroyed and a further 40,000 were damaged by smoke and water in a fire that occurred in the Duchess Anna Amalia Library housed in a 16th-centry rococo-style palace in Weimar, Germany.*

INDUSTRY'S FIRST RESPONSE

Halocarbons – Halon-like compounds – generically know as HFCs, were the industry's first response to the need for alternatives to ozone depleting agents.

The Future of Suppression Systems is here

Some proved effective and were adopted by the fire industry and building occupiers, while others failed due either to their inefficiency as a firefighting agent, or their toxicity. In reality, they often turned out to be solutions that did not live up to their early expectations. The more successful and acceptable were broadly embraced. The important point, however, is that these agents were not without an environmental downside. Without exception, all had significant global warming potential.

The fact that global warming results in climate change is now widely accepted. So much so, that the Kyoto Protocol (or to give it its full title, the Kyoto Protocol to the United Nations Framework Convention on Climate Change) has, as its goal, the reduction of greenhouse gas emissions. Rainfall patterns are changing, as is evidenced by the increased flooding in many parts of the world; sea levels are rising; glaciers are retreating; polar sea-ice is thinning; and the incidence of extreme weather is increasing in some parts of the world. If this trend continues, it is inevitable that there will be permanent flooding of many low-lying areas.

Pic courtesy of Tyco Fire & Security

THE INERT GAS OPTIONS

The industry's answer to the global warming challenge was inert gases, as they have precisely the environmental credentials that the market was seeking – zero ozone depletion potential, zero atmospheric lifetime and zero global warming potential – and represent the market's first truly sustainable "clean" fire suppression technology. Inert gases are non-toxic, they will not harm sensitive electronic equipment, art treasures or documents, and are safe to use in enclosed areas where people may be working.

These are a non-conductive and non-corrosive blend of naturally occurring gases or, less frequently, a single naturally occurring gas. Inert gas suppression systems, such as Tyco's new Hygood i3 system, work by lowering the oxygen content of the protected area to a point that will not support combustion, but is sufficient to sustain human life. This, it is important to bear in mind, is unlike Carbon Dioxide systems that, when used at design concentration, are lethal to room or enclosure occupants.

Welcoming i3's environmental characteristics, the market recognised that the system does not add or take anything away from the environment. This is because it is a pure 50:50 mixture of Argon and Nitrogen, which already circulate freely and naturally in the atmosphere. The two gases have a density similar to air and so the mixture is able to retain its concentration once discharged for far longer than Halon. It forms no breakdown products and therefore minimises the risk of consequential damage to the carefully balanced ecological system.

i3 reduces the ambient concentration level of oxygen when discharged in a risk area to between 10 percent and 14 percent; oxygen concentrations below 14 per cent cannot adequately support combustion and therefore can extinguish a fire. It is stored in high-pressure steel containers, with an operating pressure of 300bar. Alternatively, a 200bar system is available in markets where 300bar technology cannot be easily refilled. There is also the option of them being stored remotely from the protected area as a bank of cylinders can be used to safeguard more than a single room or enclosure.

So, to organisations specifying that a non-chemical suppressant is of overriding importance, i3 is an attractive

> *The industry's answer to the global warming challenge was inert gases, as they have precisely the environmental credentials that the market was seeking – zero ozone depletion potential, zero atmospheric lifetime and zero global warming potential*

option. But, there was clearly a strong desire in the market for a new chemical fire-extinguishing agent, one with the advantages of the early Halon-like alternatives, and with the environmental profile of the inert gas systems. In short, a chemical system to complement the inert gas systems already on the market.

THE SUSTAINABLE CHEMICAL REPLACEMENT

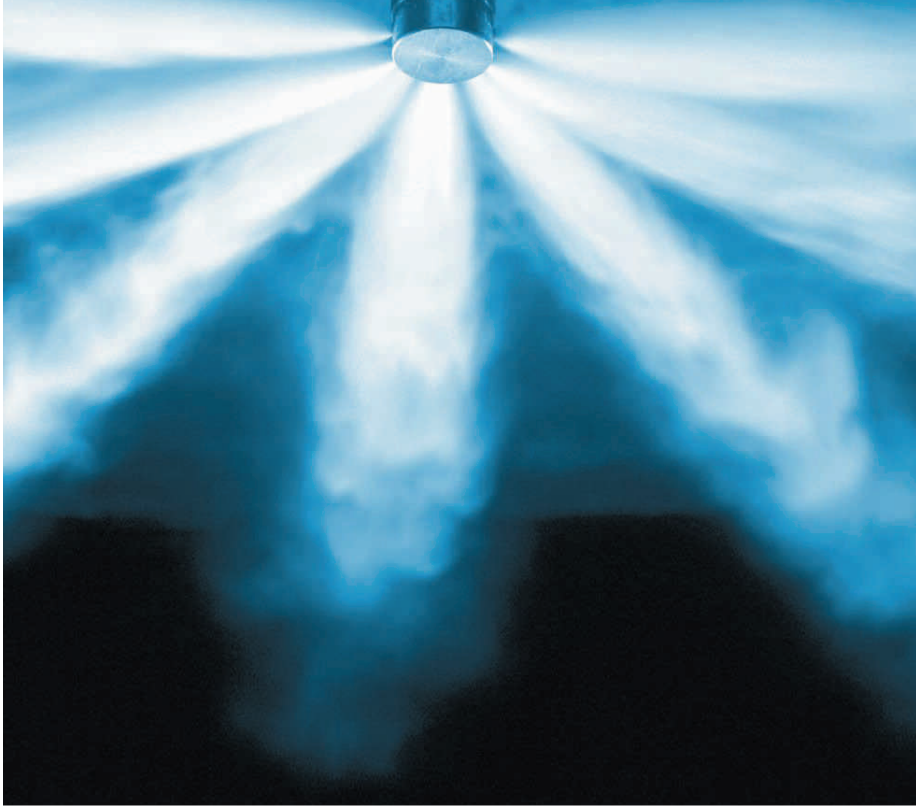
The latest solution meets all of the market's requirements and is the result of more than four years concentrated effort and testing. Sapphire is a high performance fire-extinguishing system, utilising 3M Novec 1230 Fire Protection Fluid, that has a negligible impact on the environment and is designed to protect essential and delicate telecommunications and data processing equipment, plus it has applications within the cultural heritage sector protecting artefacts that would otherwise be destroyed by water from traditional sprinkler systems. This solution has an insignificant global warming potential, lower than any of the halocarbon agents acceptable for use in occupied spaces. In a word, the solution is sustainable.

It is a fluid-based system that uses long-term technology that not only satisfies today's regulations, it also meets all of those in the foreseeable future. It utilises new technology and has several advantages over other Halon alternatives, or extinguishants currently on the market with unacceptably high global warming potential. International certification of new fluid-based system includes LPCB approval, UL listing and FM approval.

Installations of the new system have a footprint similar to that of chemically based clean agent systems, the lowest level of design concentration and the highest safety margin of any viable Halon 1301 or chemical alternative. The suppressant also has impressive "environmental footprint" credentials with zero ozone depleting potential and a remarkably low atmospheric lifetime of just five days. This compares with an atmospheric life for Halon 1301 of an astounding 107 years. Significantly, it is not included in the basket of greenhouse gases identified by the Kyoto Protocol.

To put this into perspective, the fluid has a global warming potential of just "one".

Compare this with a not untypical HFC, HFC 125 (that, incidentally has a atmospheric lifetime of 33 years, against the new fluid's five days) and for the release of just one kilogramme of the HFC, 2,800 kilograms or 2.8 tonnes of the fluid would have to be released to have the same impact on climate change.


Pic courtesy of Tyco Fire & Security

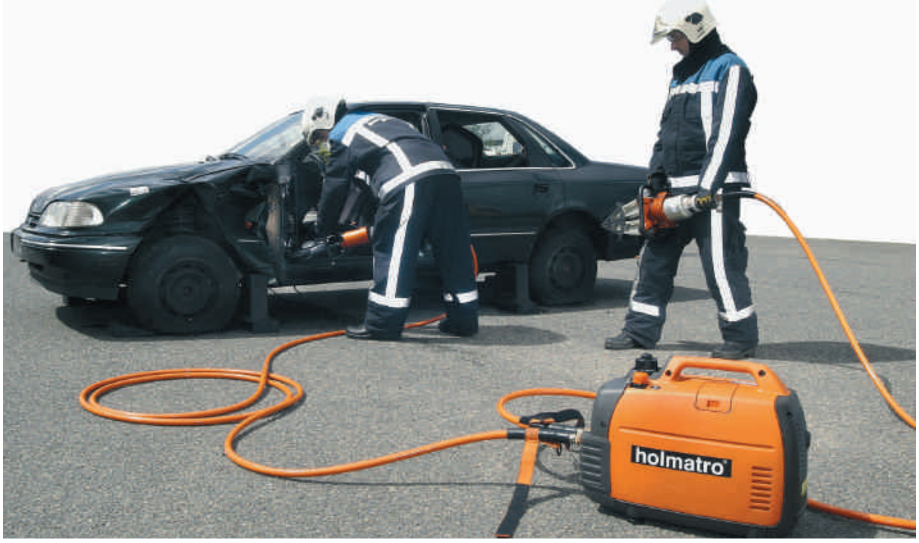
Sapphire's fluid is stored in cylinders as a low vapour pressure fluid that transmutes into a colourless and odourless gas when discharged. Unlike other fluid fire extinguishing agents, it can be used with absolute confidence to suppress fires involving electronic, computing or communications equipment. This has been graphically demonstrated by immersing a laptop computer into a tank of the fluid and showing that, not only does the laptop still work after the dunking; it works while it is still immersed in the tank. Similarly, the suppressant's suitability for protecting archives and museums has been established in similar witnessed trials that prove that a document can be immersed in the fluid without damaging it, or even causing the ink to run!

Typical total flooding applications use between just four and six percent by volume of the fluid, which is well below the agent's saturation or condensation level and, when discharged, the agent is dispersed through natural ventilation, leaving no residue to damage sensitive electronic equipment; it is also non-conductive and non-corrosive.

One of the significant attractions of Halon 1301 was that it was seen to be safe for humans at normal use concentrations, which lead to its acceptance for use in occupied spaces. However comparing the gases' NOAEL or No Observed Adverse Effect Level with its normal design concentration of five percent clearly shows that Halon had no safety margin.

While certain HFCs and inert gases are used at design concentrations that are below the NOAEL, with safety margins that range from seven percent to 20 percent, no other Halon alternative comes close to the new fluid systems 92 percent safety margin.

An inevitable consequence of the signing of the Montreal Protocol was that Halon installations around the world have been replaced with alternatives systems. However, during the intervening years, environmental concern continued regarding many of the first generation replacements. Companies about to commission new installations are understandably anxious to ensure that they do not run the risk of choosing a solution that itself may face decommissioning a few years down the line. For them, long-term sustainability is the key issue, and one that is, for the first time, convincingly addressed by Hygood i3 and Sapphire.



Simultaneous operation of two new Holmatro® Rescue tools equipped with CORE™ Technology with the new, light, quiet and compact DPU 31 PC Duo Pump: only one coupler per rescue tool!

HOLMATRO INTRODUCES CORE™ TECHNOLOGY

The next step forward in extrication equipment

After the introduction of hydraulics four decades ago, the shift in rescue techniques of the 1980's, and the vehicle design and rescue tool developments of the last ten years, Holmatro Rescue Equipment now introduces a technology that ranks with the most important innovations in the field of extrication: CORE™ Technology. It will make extrication procedures *quicker*, *easier* and *safer* than ever!

What is CORE™ Technology?

CORE™ Technology (COaxial Rescue Equipment technology) refers to the hoses, couplers and valves of a rescue system. In other words: the way hydraulic oil is directed from pump to tool and vice versa. The new CORE™ system makes use of a high pressure line (providing the usually high pressure supply of hydraulic oil to your tool) *inside* the lower pressure return line. This means that the rescuer is left with a combined supply and return line in one hose as opposed to the traditional dual hose system which consists of a separate pressure and return hose connecting pump and rescue tool. Using CORE™ hoses results in less (separate) hoses on the extrication scene and in the action circle.

CORE™ Technology: Turning point in speed, ease and safety of operating hydraulic rescue tools.

Quick & easy

Setting up a rescue system using CORE™ hoses is much quicker and easier than setting up a traditional system. Certain steps do not even have to be taken anymore. Also, the innovation within these couplers is the fact that they automatically allow for return of flowing hydraulic oil whenever they are not connected. Therefore you no longer have to activate the hoses at the pump and **tools can be changed at any time even though the hose is under flow with oil being pumped through it by the pump.** Not only does this imply a more efficient use of manpower, it also means that the remaining steps for setting up a CORE™ rescue system can be taken at random order. You simply start the pump, connect the hoses to the pump and the tools to the hoses and you can start using the tools.

A CORE™ hose unrolls very quickly since the couplers can freely rotate 360° and because it is reinforced with state-of-the-art multi-layered Kevlar (no steel!) On top of that a CORE™ hose has fewer autolock couplers than a traditional dual hose (2 instead of 4). This means less 'coupling and clicking'.

Safe

The fact that the high pressure line is totally encased within the low pressure return line obviously makes the new CORE™ system safer than a traditional rescue system. After all, damage of the inner hose is much less likely since the high-pressure hose is not in direct contact with the outside environment. In the highly unlikely case that the inner high-pressure hose of a CORE™ system burst or leaks, the pressure relieve valve will instantly reduce the pressure. This design ensures that the pressure in the outer hose can never exceed 25 bar, which removes any possibility of the user being exposed to high oil pressures.

Being reinforced with Kevlar, CORE™ hoses provide a much greater degree of hose flexibility. What's more, even Holmatro's most rigorous and prolonged test scenarios have not resulted in any kinking (or any possible damage resulting from it) of CORE™ Technology hydraulic hoses.

Simplify your extrication techniques

The above mentioned features make it safe to say that CORE™ Technology truly is a revolutionary turning point in rescue tool technology. It is definitely more than a new piece of equipment. It allows you, as a rescuer, to re-think and simplify your extrication techniques and your standard operating procedures, as well as the very underlying concepts these techniques and procedures are based on. Holmatro already equipped its brand new 4000-series of hydraulic rescue tools standard with CORE™ Technology.

If you want to know more about CORE™ Technology, please visit www.coretechnology.info. More information about the new Holmatro® 4000-series can be found on www.holmatro.com

For further information,
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Heed the Warnings

Picture courtesy of Fulleon Ltd

By Bob Choppen
Product Manager
Fulleon Ltd

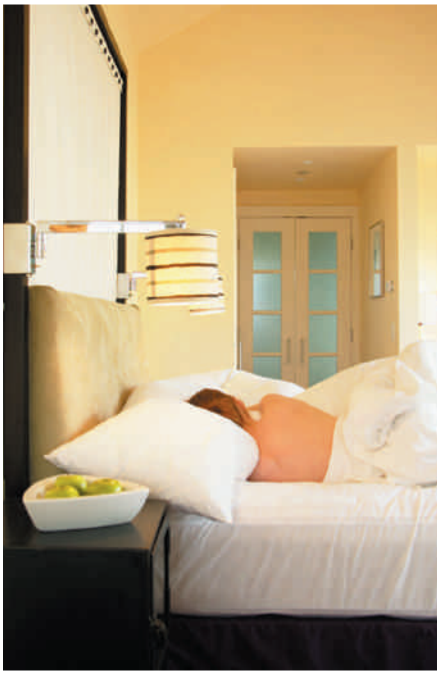
THE ISSUES FACED IN warning people of an emergency have not materially changed since automatic alarm systems first became available, but sometimes we become aware of the particular short-comings of the techniques we are using.

The first automatic electrical fire alarm was conceived over 150 years ago, based on a simple heat switch and an electric bell, so it is perhaps surprising that the majority of alarm systems still rely on a simple audible signal to warn building occupants of an emergency. Developments in technology, particularly in electronics and software, have permitted huge advances in the capabilities of fire detection allowing dangerous or damaging situations to be identified in the very earliest stages of development. By comparison the method of providing the alarm has barely changed at all. Bells are still commonplace and most systems simply rely on an audible signal to warn the occupants of a building.

WELL INFORMED?

It is widely accepted that sounders alone provide little information and therefore may have limited effect when trying to relay a warning to the general public.

An alarm tone only means something if the person hearing it has been trained to understand it. Therefore it is imperative that building occupants are educated to respond in an appropriate manner when they hear a specific alarm signal. This can be achieved where there is a relatively stable population within the building, but sites with changing occupation, such as retail premises, hotels and sports facilities, cannot realistically ensure that every visitor is aware of the procedures to follow when they hear an alarm. Some countries have well established standard national alarm tone(s) for fire signalling, and the safety message can be instilled in the population from a very early age, but in countries such as the UK this is not the case, so the alarm characteristics are almost certain to change from building to building.



Picture courtesy of Fulleon Ltd

In larger public spaces, the trend is to use spoken messages that can convey much greater levels of information and therefore elicit much quicker and more appropriate responses from the people affected. Additionally some systems will allow the content of voice messages to be changed to suit different situations so that the action taken can be modified to suit the circumstances. Message must be kept short and concise and also in languages that are commonly used in the locality in order to minimise confusion.

Voice systems are available in a wide variety of capabilities and complexities, ranging from simple Voice Sounders to Public Address Voice Alarm (PAVA) systems. Voice can be extremely effective if applied correctly, but like most complex technologies the skill required to get the initial system design correct is proportionately greater and costs are increased compared to tone-only

Heed the Warnings

sounders. Despite the improvements in communication that voice systems can and do bring, sounders and voice systems still communicate using only audible means. To be effective sounders must be audible, in other words at least 6dB above any background noise. however with speech there is the added complication of ensuring the intelligibility or clarity of the message, which is a more complex attribute to achieve and even more difficult to verify on site.

SEE AND HEAR

Audible signals alone cannot be effective for all people under all conditions. We have to consider that there are many situations where audibility or intelligibility of alarm signals cannot be achieved; either because people have hearing impairments or the signal is masked by high background noise or perhaps the use of ear defenders. It is neither practical nor safe to make sounders louder and louder to overcome background noise and indeed increasing volume may aggravate conditions for speech intelligibility, thus additional types of warning devices have be considered where audible units alone will not suffice.

If there is a risk that the audible alarms will be ineffective then additional measures are needed that will stimulate other senses, in other words this comes down to sight or touch. (At the time of writing I am not aware of any systems that employ smell or taste as an *alarm* medium for fire systems, although humans can readily *detect* and identify fire quite readily using these senses. Smell has been used to give warnings of localised emergencies such as gas leaks or overheated machine bearings, but the debate then becomes whether this is detection of the situation or a warning.)

The use of visual warnings (beacons) is becoming more popular as the limitations of using only audible signals is becoming better appreciated. There are however a number of problems in designing systems to use beacons that are not yet properly resolved.

Guidance on how to use and apply

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> *Even where manufacturers do supply light output figures they are usually quoted for a clear lens – if a filter is then added to achieve a particular colour then light output will drop significantly.*

beacons is extremely sparse, there being, apparently, only one source of information which seems to form the basis for all advice currently available. This is the Americans with Disabilities Act (ADA) where guidance is specifically related to beacons that comply with Underwriters Laboratory (UL) standards.

Outside of the USA and countries that follow its philosophies there is no definitive guidance for the deployment of visual alarms. This is a problem; not only for the system designers, but for the manufacturers too. If there are no design standards, product development becomes subject to large degree of guesswork so the performance of beacons varies considerably from supplier to supplier. Measuring beacon performance is also technically more difficult and costly than for sounders; therefore the information provided by suppliers is usually quite rudimentary and has little relevance to the most important aspect, the light output of the beacon. In Europe a useable standard for visual alarms is still around two years away (EN54-23) and possibly even longer before application guidance is issued.

Even where manufacturers do supply light output figures they are usually quoted for a clear lens – if a filter is then added to achieve a particular colour then light output will drop significantly, typically a red lens on a xenon beacon will reduce light output by as much as 70%.

Xenon beacons do also present systems engineering with problems due to their high power demands, which restricts their wider application. Often system designers will choose a beacon based purely on the basis of lowest current consumption regardless of its effective light output, which may well render it inadequate for its intended purpose.

SHAKEN AND STIRRED

The other sense frequently used in alarms is touch, where a vibrating device is employed that does not rely on either hearing or sight.

Picture courtesy of Fulleon Ltd

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Heed the Warnings

More usually considered as a device for people with hearing impairments and therefore a special application rather than for general use, vibrating pads are now regularly used under pillows of sleeping people who have hearing impairments. Alternative methods include radio pagers with a vibrating facility and possibly a text display to indicate the reason for the alarm. This is similar to mobile phones which employ a vibrate facility which can be readily felt even when the audible alarm is turned off.

The problem with vibrating devices is that they must be in physical contact with the person, which is not always easy to achieve. Vibrating pillow pads are very good when in place, but can be displaced and may be less effective if the sleeper is not laying in the bed conventionally and of course people, in a hotel for instance, do not necessarily fall asleep in bed. Portable radio linked units, have to be worn at all times to be effective, but being portable they have to be removed to recharge batteries, or when changing clothing or washing. Human factors also play a part in that the people who would benefit from vibrating devices have to be identified when they enter a building, or they themselves must declare their needs to an appropriate person who can allocate a device to them.

A UNIVERSAL SOLUTION?

In most practical situations alarm sounders still represent the most flexible and easy to use alarm method. The simple fact that sound can flow around obstacles makes siting a relatively non-critical procedure, although It is important to achieve adequate sound levels which will be heard above any background noise and be distinguishable from any other sounds which could occur locally.

In the UK about one person in seven is classified as hard of hearing with about one in 150 who cannot hear well enough to understand a voice even if amplified. These figures are increasing as the average age of the population steadily rises; therefore it is probably wise to assume that a number of the people in a public building will not be able to respond to audible alarms whether based on tone-sounders or voice alarm equipment. A further group, approximately one in 2,500, can neither respond to audible or visual alarms, so while the addition of visual alarms is to be recommended, they are not the total answer. Visual alarms must also be in the line of sight to be effective – someone standing with their back to a visual alarm will not be aware of its operation unless they pick up a reflection from a shiny surface.

Where people are active vibratory devices need to be portable, they have to be in contact with people and people move even when asleep. As already discussed there will be periods when there effectiveness is reduced due to the practicalities of everyday living.

Generally alarm systems will rely on a combination of the measures outlined above. However in some cases even the most comprehensive alarm systems may need to be supplemented by trained personnel to assist and organise an efficient evacuation.

> Despite the variety of alarm devices available to the system designer, none has moved beyond a simple stimulation of a human sense. Some alarms can provide directional guidance for escape routes, but will still rely on a degree of training to be effective. Few provide a totally intuitive warning that is independent of language, culture and basic training. In the longer term standardisation of alarm methods and training from a young age will probably be more effective than the introduction of new alarm technologies.

Picture courtesy of Fulleon Ltd

FSI NORTH AMERICA®

Fire Safety International, Inc.® (FSI North America® (FSI)) is a 10 year old Cleveland area Ohio USA based company founded and managed by the Conron Family.

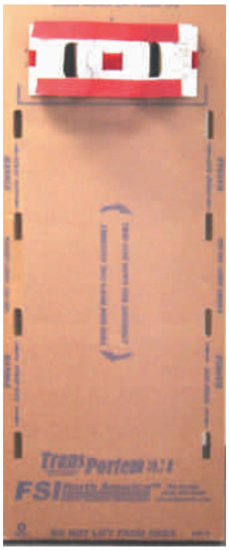
FSI currently offers amongst the world's largest selection of Portable, Mobile and Fixed Hazmat Decon Showers/Shelters and Accessories.

In addition, to complement this range and a complete EMS product offering, FSI recently launched a complete range of patent pending **FSI “Transporter” Fluid Resistant Disposable Adult and Pediatric Backboards.**

These **FSI “Transporter” Fluid Resistant Disposable Adult and Pediatric Backboards** are offered in a number of configurations (with/without straps, autocradles, C Collar, other).

The obvious advantages of these boards are as follows:

- They come packaged in boxes of 5 and take up little space since they store flat.
- When needed simply pull the zip tabs on the back of the boards and in less than 30 seconds a fully configured backboard is in place and ready to go to work. There is no glue or tape to dry out and fail over time.
- The specially coated structural cardboard can be left out in the soaking rain overnight and yet the adult board can still hold 500+ pounds (225+ kg) of dead weight the next day. The Pediatric board is 150lb. (68kg) rated.
- Cardboard, relative to plastic type boards is a far more biodegradable substance over time.



FSI “Transporter” Fluid Resistant Disposable Adult and Pediatric Backboards are significantly lower in costs than all other backboards.

In the event of a true mass casualty incident in which literally hundred's or even thousands of victims may require stretcher borne attention it becomes readily apparent permanent Backboards that are in limited supply in most areas will simply not be able to handle the emergency. Examples of such incidents include:

- Airports which must plan for the worst – usually a #747 Jumbo crashing.
- Stadiums where huge crowds gather.
- Major Mass Casualty/Mass Trauma/Mass Hazmat Decon incidents – from an Anthrax/Smallpox/other terrorist incident.
- Train/Bus/Subway accidents/incidents.

To handle worst case scenarios as described above FSI packages MCI Trailer Systems in multiple sizes and configurations which include quantities of **FSI “Transporter” Fluid Resistant Disposable Adult and Pediatric Backboards** tapes, splints, triage supplies, IV Fluids, traffic control supplies, hazmat decon showers, shelters, accessories, *et al.*

FSI is planning for tomorrow today.

For further information,
please contact:

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Sheffield
OH 44054
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9 CORPORATION & VORTEX TECHNOLOGIES

The First-Ever, All-in-One (Live, Neutral and Ground), AC Surge Suppressor/Filter with Patented GTT Ground Transient Protection Designed to Safeguard all Microprocessor-based Fire and Security Equipment.

MODEL NAME: Theon INL08000

9 Corporation and Vortex Technologies strategic partnership has established a new standard for electrical transient and surge suppression for fire and security alarm systems and equipment. The Theon is the only point of protection device that offers true 3-line (Live-Neutral-Ground) protection in a convenient, cost-effective package. Prior to this breakthrough there was no way to protect Live, Neutral, and Ground with a single product. The Theon technology, driven by demand in the fire and security industries to keep ground "clean", uses continuous attenuation to filter out interference on the ground line caused by a myriad of external influences and power quality issues.

The Theon is built upon on 9 Corporation's own UL recognized GTT technology which works by opposing changes in electron flow on the ground wire while not compromising intrinsic ground safety. Additionally, the Theon utilizes multistage non-degrading surge suppression along with common-mode filtering to eliminate power surges and sags. The multi-stage surge suppression circuit has an active response time of less than one nanosecond while maintaining continuous high frequency filtering on ground, extremely beneficial when protecting sensitive microprocessor-based fire and security equipment.

Applications include fire and security systems, alarm and security panels, digital video recorders (DVR) and security cameras, biometric equipment, and access control systems (protecting any microprocessor-based electronic device ensuring the utmost in reliability, clarity and quality performance).

The Theon is easily installed or retrofitted into any existing fire or security alarm system or panel and is available in two models. The model INL08000 is a hard-wired version that provides screw terminals for interconnection. The model INL08001 (available August 2005) is a line-corded version allowing easy connectivity to PC-based systems.

120 VAC with maximum 15 amp continuous current rating (details of 240 VAC 10A version are available on request). Standard Operating Temp -20 to +70 degrees C, Surge life >100000Hrs

Ground attenuation between 50 kHz to 2.0 GHz, Weight: 23.98 oz. L=7.87 inches, W=3.94 inches, H= 1.97 inches.

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BACOU-DALLOZ PROTECTIVE APPAREL

We are pleased to announce the launch of the new **FireProtex™** brand from **Bacou-Dalloz.** FireProtex derives its name, and will share the "same box and shield" logo as **Securitex®** – a brand long recognized in North America for innovative protective suits and fabrics.

We also take this opportunity to introduce our new **FireProtex™ SMS ULTRA™ Series Fire Protective Suits** and **FireProtex™ T-Series Fire Protective Suits** certified to meet the EN-469 European standard for protective clothing for firefighters.

The **Ultra Series** model is designed to meet the needs of a great majority of departments seeking premium gear with innovative design features. This model is offered with three different fabric combinations.

The **T-Series** models are designed to meet the needs of a great majority of fire brigades seeking durable and performing gear. The T-Series is available in three models, that includes a value-engineered version designed to meet the needs of budget-conscious brigades.

Bacou-Dalloz Protective Apparel Ltd. manufactures and markets certified protective garments for firefighters and emergency responders worldwide. These products include fire and EMS protective garments as well as boots and other accessories. Securitex markets fire protective products certified to the NFPA standards while FireProtex markets similar products certified to the EN European Standards.

About Bacou-Dalloz

The Bacou-Dalloz Group is the world leader in the design, manufacture and sale of Personal Protective Equipment (PPE). The company employs about 6,500 people and operates 43 production facilities. Bacou-Dalloz provides unmatched head-to-toe protection through two strategic business segments: head protection (eye, hearing and respiratory) and body protection (fall protection, gloves, clothes and shoes). Bacou-Dalloz offers a full product range aimed at the manufacturing, construction, telecommunications, medical, public services and other sectors. Its products are available directly from the company or its distributor partners worldwide.

For further information, please contact:
Bacou-Dalloz Protective Apparel
Tel: +1 514-282-0503.
Email: bd-info@bacou-dalloz.ca

THE IVECO MAGIRUS AIRPORT RECEPTION COMMITTEE

The protective fire safety on airports is generally considered to be one of the most complex and greatest challenges for the fire services – and thus also for all manufacturers of fire fighting vehicles. **IVECO MAGIRUS** offers a world-wide unique product range for holistically covering all potential hazards that must be met on airports.

For the protection of buildings and facilities, IVECO MAGIRUS offers a wide range from command vehicles via first-intervention vehicles, light and special fire fighting vehicles to various different turntable ladders and aerial telescopic platforms with a rescue height of up to 54 m. Rescue vehicles and equipment carriers as well as swap body vehicles with a large roll-off container program complete the range.

With the airport crash tender range DRAGON x4, x6 and x8, IVECO MAGIRUS offers three variants in this "top of the range" category, that will meet even the most specific requirements. Real powerhouses in the form of currently unrivalled high-performing IVECO 1,024 hp or 1,500 hp engines with last generation common-rail injection technology do not only provide for an enormous acceleration but also for an enormous fire fighting power. Up to 6,000 l/min pump capacity, 14,000 litres fire fighting agents in a combination of water, powder, and foam as well as precise monitors with long throw ranges guarantee a fast and effective fire fighting operation.

The excellent cross-country capabilities of these vehicles provide for an unrestricted mobility and ensure that fire fighting can also be effected away from the runway without any loss of time.

The IMPACT series, with the variants x4 and x6, is the ideal completion to the DRAGON range or even a cost-effective alternative, e.g. for smaller airports. Based on highly cross-country capable, single tyre IVECO four-wheel-drive chassis, these vehicles are extremely mobile but nevertheless equipped with an impressive fire fighting power: depending on vehicle type up to 12,000 litres of fire fighting agent can be carried on board. This concept has been very much proven in practice as is shown by the more than 150 IMPACT vehicles that are currently in world-wide operational use at airport fire service departments.

A network of service stations available on a 24h basis in almost 150 countries around the globe ensures that IVECO MAGIRUS vehicles remain ready for operation at any time.

For further information, please contact:
Iveco Magirus
Email: magirus@iveco.com
Website: www.iveco-magirus.de

OGURA & CO. LTD.

Ogura, established in 1928, is a leader in battery-powered hydraulic rescue tool technology. Their lightweight rescue tools have been designed to give the user maximum ease of mobility and with no setup time are ready for immediate action. The commercially available battery slots into the base of the pistol grip style handle where it is easily removed for charging. Battery maintenance is made easy with the Ni-MH battery that has no memory issues. Chargers are available for in vehicle or A.C charging and charging time is 1 hour. All the tools come in their own carrying cases with battery, battery charger, spanners and manuals. Suitable for a wide variety of rescue situations the range includes cutters, spreaders, and combination tools.

The year 2005 has seen further improvements to the Ogura product range with the introduction of the HRS-93 Rescue System. Based on the popular HRS-92 the new HRS-93 modular system is powered by an 18V Ni-MH Makita battery. The choice of interchangeable tool heads has been increased and in addition to the standard cutter, spreader and bar cutter, there is: a Stubby Shear, ideal for padlocks, chains, and security bars etc.; a larger more powerful Cutter Head suitable for car posts, car roofs, steering wheels etc; a Door Opener which can also be used as a mini ram or jack that has 39.3 kN (4 t) of opening/lifting force. All the tool heads except for the Door Opener can be connected directly to the HRs-931 pump unit or via an extension hose.

The operating performance of the BC-250 Combination Tool has been improved by the new design combi blades and will now cut 24 mm round bar to prEN cutting test category F. or NFPA category 5. Factory tests also show that the life of the blades has been considerably extended.

Other improvements presently in development are a dedicated cutting blade that will be interchangeable with the combi blades on the BC-250 and a bar cutter with angled head that will cut bar flush with the surface.

For further information, please contact:
Ogura & Co. Ltd.
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The solution is to use a respirator capable of supplying true positive pressure at all times – even during hard work. It is also important to be able to speak, shout instructions, cough, clear your throat and catch your breath while still wearing the respirator.

The new SE400 positive pressure demand respirator gives positive pressure of more than 400 litres/minute, enabling you to work hard, maintain voice communication with team mates, and still be protected by safe positive pressure without inward leakage.

The SE400 is used by emergency personnel all over the world. It is used for domestic preparedness, first response, rescue operations, fire and forensic investigations and much more. It was used by specialist teams in the two latest Olympic Games, during the SARS crisis, and in many anti-terrorist events.

The SE400 is a completely integrated system of respirators, filters, protective suits, voice communication and much more.

The S.E.A. Group has distributors in China, Taiwan, Singapore and other places throughout Asia.

For further information, please contact:
The S.E.A. Group
Tel: +61 2 9910 7500
Website: www.sea.com.au

VISION SYSTEMS EXTENDS VESDA PRODUCT RANGE

LaserFOCUS VLF-500 provides very early warning smoke detection for business-critical areas up to 500 square metres.

Vision Systems, the leading supplier of air sampling smoke detection systems, has released the VESDA LaserFOCUS VLF-500 air sampling smoke detector, designed to protect areas of up to 500 square metres.

“The features of the LaserFOCUS VLF-250 have been so well received by the market that we decided to extend the range with another entry-level model that covered a larger area. The LaserFOCUS VLF-500 fits nicely between the 250 sqm coverage of the LaserFOCUS VLF-250 and the 800 sqm coverage offered by the VESDA LaserCOMPACT model.

Fire engineers will now have more choice when designing cost effective VESDA fire protection systems,” said Scott Wilson, Senior Fire Product Manager at Vision Systems.

The LaserFOCUS VLF-500 offers the same features that have made the VLF-250 so popular – out-of-the-box installation that slashes onsite installation and commissioning times, a series of pre-engineered pipe network designs that reduce design effort and the Instant Fault Finder™ feature that allows any problems to be identified and relayed to a service engineer, ensuring they arrive onsite fully prepared.

The LaserFOCUS VLF-500 offers cost-effective fire detection for areas such as data centres, small telecommunications facilities, control rooms and other spaces that are critical to the continuity of your business.

For further information, please contact:
Vision Fire & Security
Tel: +61 3 9211 7200
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Issue 15 – September 2005
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REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

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ASIA PACIFIC FIRE MAGAZINE

REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

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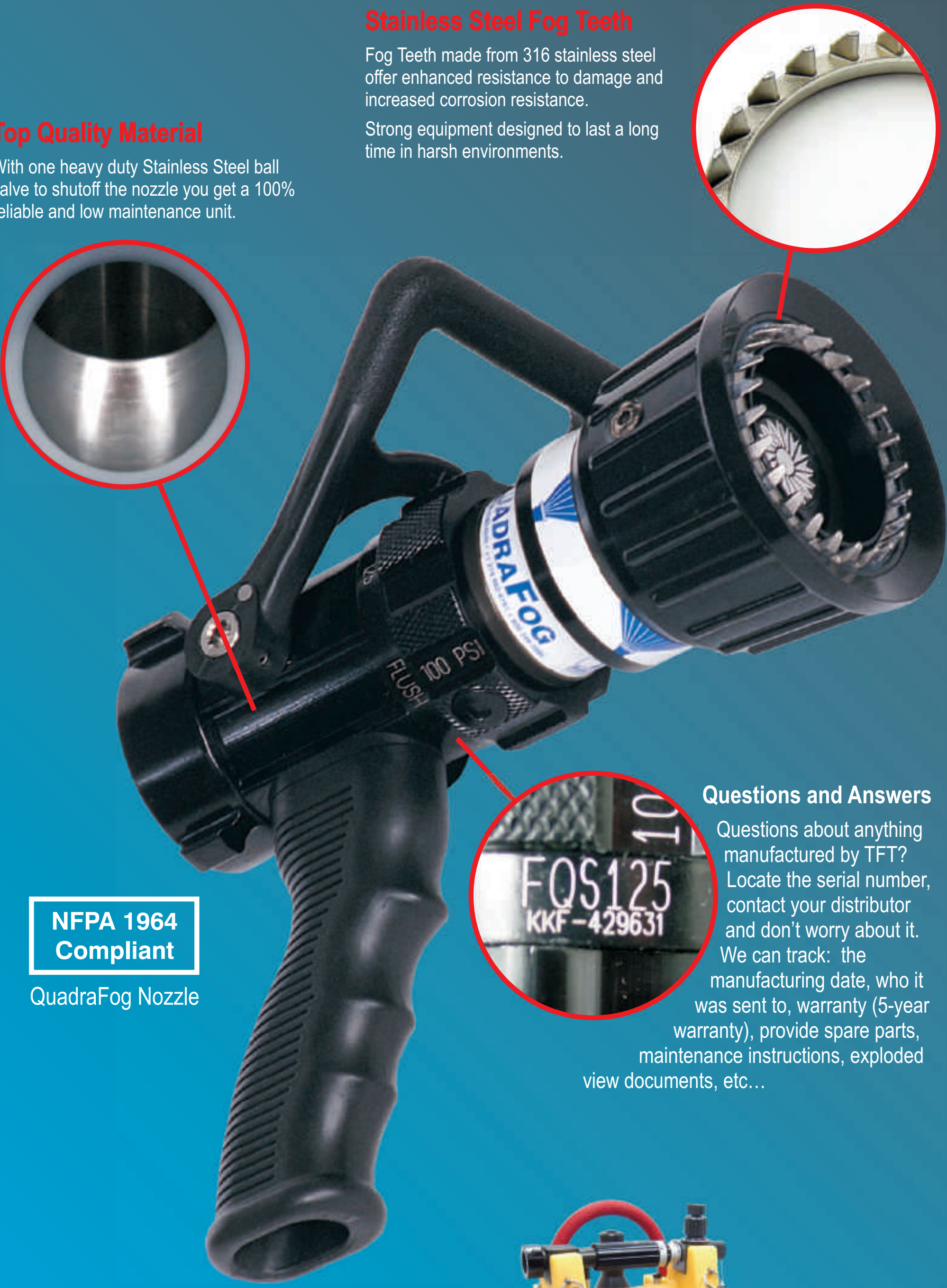

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December 2005
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ASIA PACIFIC FIRE MAGAZINE
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Front Cover: Indian firemen look for survivors among debris of collapsed wall of a building under construction in Mumbai India. Picture courtesy of REUTERS/Punit Paranjpe

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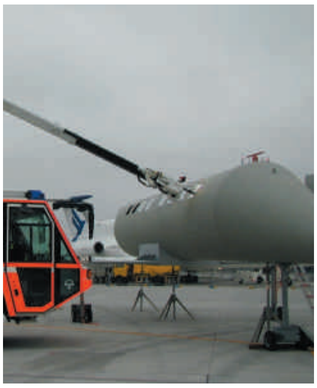

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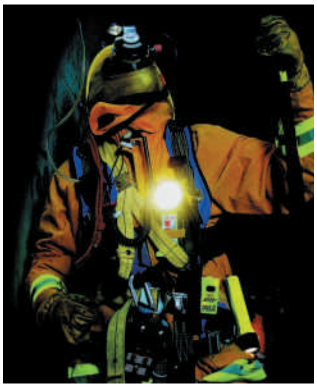

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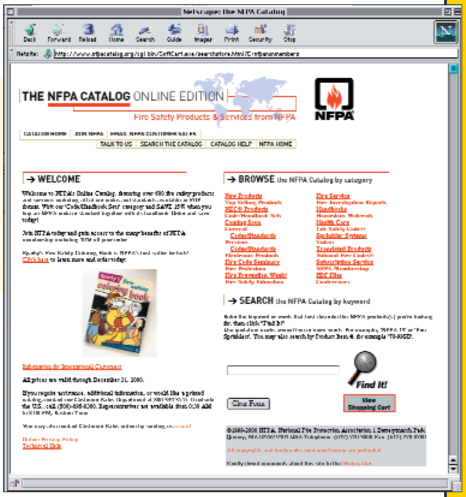
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Angus Fire Foam Base (Sub-Surface) Injection System. Fuel-resistant aspirated UL Listed Angus TankMaster foam of typical expansion ratio 2 to 4:1 is injected into the base of the tank above the water level at a pre-determined minimum application rate and operating time. Foam rises through the fuel to form an extinguishing foam blanket on the surface of the burning fuel. The system incorporates Angus Fire Series 2 High Back Pressure Generators (HBPGs) to overcome the back pressure exerted by a static head of fuel. Installation by Kampuwat Co. Ltd., the Angus Fire distributor in Thailand

ANGUS FIRE fixed foam systems are protecting the aviation fuel depot at the new Bangkok International Airport. Also called Suvarnabhumi Airport (Suvarnabhumi means 'Golden Land'), the Airport is due to open late 2005 (more info at Website: www.suvarnabhumi.com).

Japanese Deflate In Favour Of Metal Frames

PPS Secures Osaka Airport RD Shelter Order

An order for six rapid deployment shelters has been placed by the KIAC Company with PROFESSIONAL PROTECTION SYSTEMS. KIAC are the company responsible for providing facilities of all kinds at Japan's airports and the six shelters, the first of a much larger order, are destined for Osaka airport.

The shelters, all based on the design of the metal frame units, which PPS has supplied to the UK government to house its mass-decontamination facilities, represent a major change in Japanese thinking which until now has been centred on inflatable units.

According to Mark Whitcher, PPS Managing Director, the change in thinking was based upon the longevity and flexibility of metal frame systems and the fact that they do not spring leaks and if damaged can usually be repaired with great swiftness and relative ease. "This plus the fact that they can be deployed with the same speed as an inflatable clinched the deal I believe" says Whitcher.

Internally the spatial arrangements of the shelter interiors allow for a number of different uses; as command posts, field hospitals, scene of crime operational centres and so on.

Japan's emergency services and defence forces are already familiar with PPS equipment and are amongst the company's earliest export customers, buying the then revolutionary PPS inflatable decontamination shower in the wake of the infamous Tokyo Sarin attack. " Because of this I believe the Japanese have faith in us and what we have to offer, and this must have contributed significantly towards getting them to change from inflatable to metal frame technology and to placing the order with us" comments Whitcher.

More information, please contact:
Professional Protection Systems Ltd.
Email sales@ppsgb.com
Website: www.ppsgb.com

Fire Fighting Enterprises to Exhibit at Intersec and Fire Asia 2006

Smoke detector specialist FIRE FIGHTING ENTERPRISES LTD will be displaying its range of wide area detection products at the forthcoming Intersec and Fire Asia exhibitions. The company will be exhibiting both the end to end and reflective variants of its Fireray range of optical beam detectors in addition to its latest aspirating devices.

The Fireray F2000 is an end to end product which comprises a transmitter and receiver that are installed at opposite ends of the area to be protected. The transmitter emits an infra-red beam which is detected and monitored by the receiver, and if smoke obscures the beam an alarm is raised. Typical applications include warehouses, factories and shopping malls. The Fireray F2000 Ex has been designed specifically for industrial applications.

The F50R and F100R are reflective variants of the Fireray in which the transmitter and receiver are located in the same unit, reducing installation time and costs. The transmitter emits a signal that is then reflected back to the receiver using a reflector positioned at the opposite end of the area to be protected.

The company's laser aspirated smoke detector units utilise the highly sensitive capabilities of lasers to detect even the smallest traces of smoke. They consist of a sampling pipe, fan, cartridge filters and smoke detectors.

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For more information, please contact:
Fire Fighting Enterprises
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Website: www.ffeuk.com

Bauer Compressors Asia Pte Ltd (BCA)

Ten Years of Bauer Compressors Asia, Singapore

On the 15th of November 2005, BAUER COMPRESSORS ASIA PTE LTD (BCA) together with Bauer Comp Holding of Munich, Germany, celebrated the Tenth Anniversary year of Bauer in Singapore, as a regional base, underlining the company's commitment to Asia for sales and support of its products.

Bauer is the largest and world leading manufacturer of High Pressure Breathing Air Compressors and Purification Systems for Fire Safety and Diving applications, plus Air and Gas Compressors for Medium and High Pressure Industrial Applications. It was important that Bauer has an "Asian Base", which could support the increasing market opportunities for the premium products made by the company.

Today, BCA operates from a central Singapore facility at Delta House, Alexandra Road. The office is responsible for sales and support through distribution to more than 20 countries. BCA is one of the 11 Bauer subsidiaries, located around the world. There are two other subsidiaries in Asia, located in China and Japan.

The Distributors are a key element in the success of the company, as their number, which exceeds 30 reporting to BCA, allows the customer base the comfort of comprehensive support, which includes technical back up in the form of sales, service, spares and training from BCA.

Bauer started in 1946 manufacturing compressors and very early the company moved into the High Pressure Breathing Air Compressor Market. The first machines of this type were sold in 1956. Bauer also developed the Triplex Filter Cartridge system for Breathing Air. Many have tried to copy the concept. However, through a process of continual product development and innovation, through to quality, Bauer still remains the market leader.

The celebration Dinner was held at Raffles Hotel in Singapore. All BCA staff attended together with Mr. Heinz Bauer (President of the Bauer Group), Mr. Stephen Hines (Managing Director of BCA) and Mr. Stefan HACKER (Manager of Engineering and Business Development, Bauer Comp Holding). During the dinner, Mr. Bauer and Mr. Hines took the opportunity to thank all employees and valued agents and distributors of Bauer for their contribution to business development over the years and stated that they looked forward to an increasing commitment to Asia from Bauer.

For more information, please contact:
Bauer Compressors Asia Pte Ltd.
Tel: +65 6271 6271
Website: www.bauergroup.com

Derek Gotts joins Hale Products Europe

HALE PRODUCTS EUROPE is pleased to announce the appointment of Derek Gotts as their new Managing Director. Derek will be responsible for developing the Hale business plan in the fire fighting industry by continuing the introduction of innovative new products and services. Derek and his team, based at Warwick, will ensure the Godiva pump brand maintains its reputation for engineering excellence and value for money.

Derek has previously held senior sales positions with the Grundfos corporation, Johnson Controls UK and AHSEmstar, and early in his career was a Merchant Navy Officer.

For more information, please contact:
Hale Products Europe
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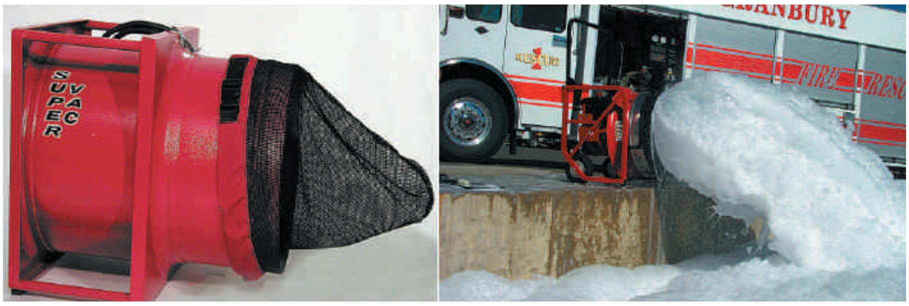

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Safety Hi-Tech srl

Replacement of existing halon installations with Safety Hi-Tech's U.L. Approved NAF S125® Gaseous Extinguishing System

There are two major concerns which are always expressed by clients when they reach the point of considering the replacement of their existing Halon 1301 systems, both of them result in some cost.

The first point to be considered is the disruption to the daily business activities and the inconvenience that this may cause to their customers, whilst the old system is removed and a new system is installed.

Secondly, the cost of the new system itself, this is assessed in two ways, the initial cost and the cost of future maintenance together with the cost of refilling, should this become necessary.

The fire protection industry has long sought to address both of these points and many manufacturers have made claims over the years with respect to retrofitting existing Halon systems. Some of the claims which have been made however do not stand up to close examination, so it is important to understand exactly what is meant by the term "Retrofit"

To retrofit an existing Halon system, implies an assessment of the current risk, a site survey of the existing installation to ascertain that the existing pipework meets current standards.

A detailed examination of the new flow calculations and system design can then be made in order to understand the changes which may need to be made to the existing layout.

Many years of experience in conducting these exercises for clients have indicated that NAF S 125® systems, which are listed by Underwriters Laboratories (UL), can be used to successfully retrofit existing Halon 1301 systems. Some installations require nozzle changes and slight adjustment to pipe sizes, usually at the end of the system, with the bulk of the pipework left in an "As Installed State"

The opportunity can also be taken to upgrade a low pressure Halon system (25 bar) to a higher pressure type (42 bar) in these instances the achievable success rate for the "Retrofit" process is substantially increased.

A recent feasibility study to retrofit an existing Halon 1301 systems for a major Petrochemical Company emphasises the benefits achievable with NAF S 125® replacement systems.

Major disruption of its processing was not an option and investigation revealed an opportunity for retrofitting the existing systems. A detailed survey of the sites was undertaken and using the data gathered, together with the detail obtained from the existing drawings and flow calculations, a study was made to ascertain the suitability of utilising the existing distribution pipes.

In 2 of the 8 systems examined for retrofitting with NAF S 125® (42bar), slight changes were required to ensure that the pipework complied with current standards; the rest required just minor changes to short sections of the piping and nozzle changes

The overall benefits to the customer are self evident, since few changes would be required, it was anticipated that in most areas, process work could continue uninterrupted.

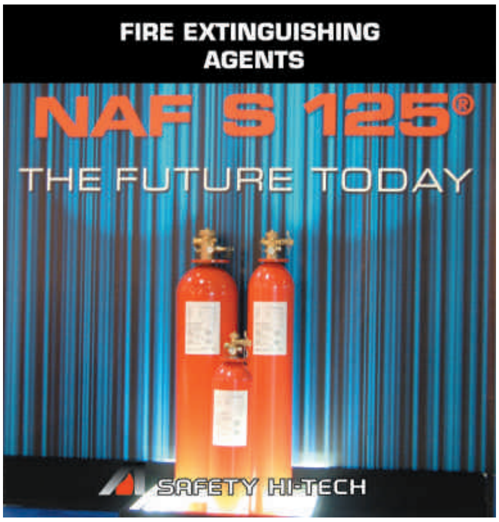
The extinguishant used in the NAF S125® systems is a unique, patented formulation containing a special additive.

During a fire scenario the additive reacts with the fire and significantly reduces the formation of the decomposition products produced by the fire, thus minimising the risk of damage to delicate equipment.

The inclusion of the additive provides an additional technical/economic benefit since it has been found to enhance the extinguishing performance.

Independent laboratory evaluation has revealed that the extinguishing performance of the system is increased, in real terms, this results in the use of less gas needed to protect a given risk, compared to systems which do not contain the additive.

The cost of the systems can therefore be reduced or if the same amount of gas is used then a greater margin of safety is offered resulting from a faster "knockdown" of the fire. APF



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Search Systems, Inc.

Victim location systems

Search Systems has been the leader in the development of technical search and rescue equipment since 1991. It was at that time that work was initiated on the first SEARCHCAM® Victim Location System using video, audio, and remote manipulation of the camera. Since that time Search Systems has become the International Standard for victim location equipment used in collapse and confined space rescue.

The SEARCHCAM 2000 and the DELSAR® Life Detector™ manufactured by Search Systems are basic components of most every major technical rescue team throughout the world. Since the establishment of the major systems indicated above, Search Systems has introduced other technical equipment designed for first-in operations, continuing operations, victim extrication, and hazmat communications, as well as products for the police, military, and security services.

Equipment manufactured by Search Systems is specifically designed using the latest technology to extend the eyes and ears of public safety personnel into voids and inaccessible areas while protecting the operators and also any potential victims. The ability to see and hear what is normally not accessible to search and rescue personnel allows them to use the valuable minutes immediately after an incident to locate victims, precisely identify their position and their physical condition, guide extrication procedures, and to generally expedite the mitigation of an incident.

The SEARCHAM 2000 has evolved from a heavy and burdensome piece of equipment that was state of the art in 1993 into a lightweight, rugged and dependable audio/video search device. The camera head articulates 180° left to right and using established search protocol can rapidly scan an entire void area to either locate or rule out the presence of a victim. The variable gain audio is also used to identify victims who may be able to create audible indicators and to also assess the nature of their entrapment and injuries as well as maintaining voice contact. The SEARCHCAM 2000 equipment series offers a 2.3 meter Standard Probe, a 6.5 meter Super Probe, and a 92 meter Cable Probe all with the same audio, video, and articulation capabilities. The detachable monitor can be used either attached to the pistol grip style control unit or it can be removed for a more convenient viewing angle or to allow other personnel to view. All SEARCHCAM equipment is compatible and the various components and accessories are interchangeable between systems. A variety of optional accessories are available including additional remote monitors, monitor extension cables, video output cables to support additional monitors or recording devices, and wireless transmitting monitors to transmit audio/video signals to a remote command center.

The DELSAR Life Detector is an acute listening device designed to detect seismic or airborne vibrations that may be created by a trapped victim. If the victim is able to create noise by tapping or pounding on concrete, steel, pipe, etc. or to yell for help the Life Detector is able to pick up the vibrations and to amplify them and translate them to meaningful video and audio signals that are monitored and interpreted by the operator. The unit consists of a series of up to six sensors that can be distributed up to 10 meters apart over the surface of a collapse area. Each sensor can be individually monitored to determine the presence of seismic or voice activity. When detected, the sensor that is closest to the activity will indicate a higher strength than the others. The sensors can then be redistributed around the location of the strongest one and the evaluation process can be repeated. This process continues until the equipment has triangulated to a specific location. At that point, other equipment such as the SEARCHCAM equipment and the Delsar Acoustic Sensor can be employed to more definitely locate the source. Some important features of the Life Detector are the ability to monitor all six sensors at the same time, the ability to monitor two audio channels at the same time (left ear/right ear), the ability to filter ambient noises such as heavy equipment and generators, and a five minute recording loop that records all activity including audio communications between the operators.

Please keep in mind that Search Systems put the **TECH** in **TECHNICAL RESCUE**. **APF**

SEARCH SYSTEMS
INCORPORATED

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Intent and Fear

If the "intent" is to create "fear",
then it's terrorism no matter what...

MultiRAE

5-gas Detector

- Choose VOC, O_2, combustible gas (LEL), CO, H_2S, SO_2, NO, NO_2, Cl, HCN, NH_3, PH_3
- Instantaneous feedback and detection for HazMat and WMD responders worldwide
- Broadband detection for Toxic Industrial Chemicals (TICs) and front-line detection of Chemical Warfare Agents (CWAs)

AreaRAE

5-gas Wireless Detector with Optional GPS

- Rugged, wireless situational awareness up to two miles away
- Choose VOC, O_2, Combustible gas (LEL), H_2S, SO_2, NO, NO_2, Cl, HCN, NH_3, or PH_3
- With ProRAE Remote Monitor Display software you can see the remote readings of up to 32 units in status view or situational placement view

Gamma/NeutronRAE Pagers

Gamma and Neutron Radiation Detectors

- Keep responders from radiation exposure
- Locate attempts to carry radiation across security perimeters
- More sensitive then Geiger-Muller or Helium tube technology
- Instantaneous feedback to front-line homeland defense, customs, border patrol, and cargo port screeners

Hazardous Environment Detection

www.raesystems.com

RAE SYSTEMS

RAE Systems
1339 Moffett Park Drive
Sunnyvale, California 94089 USA
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Sales Support: 877.723.2878

Fire Detection Technology from Securiton Switzerland

Tunnel applications

For applications with the most demanding requirements, SECURITON continually invests in research and development of fire alarm systems. Combined with Securiton fire alarm control panels, complex functionalities are programmable, to provide unique customer benefits.

SecuriSens ADW 511 Transafe – the linear heat detector

SecuriSens ADW provides best fire detection in road tunnels, underground garages storage tanks, explosion zone areas, car parks, and painting plants. The ADW 511 system is false alarm-proof and failsafe. Intelligent electronic signal evaluation means that fires are detected quickly and reliably. With continuous, fully automatic monitoring, maintenance work is reduced to a minimum. The ADW 511 meets the response behavior according to EN 54-5, class A1, is VdS and UL approved and has obtained the Certificate of German Lloyds (offshore- and vessel applications).

Linear heat detectors are based on the physical principle that, for a given volume, the pressure of a gas changes whenever its temperature changes. Over a distance of approx. 100m a copper sensor tube monitors the ambient temperature. A fire source will heat up the sensor tube locally and, with it, the air it contains. The change in pressure is instantly registered by an electronic pressure sensor connected to the extremity of the tube. To exclude faulty measurements due to pressure losses, a test motor generates a specific overpressure in the sensor tube at regular intervals. If the pressure rise actually measured does not correspond to the programmed measured value, a malfunction indication is displayed. The system is user-friendly, immune to electrical, thermal and mechanical interference, and can be used as a combined rate-of-rise temperature detector/fixed temperature heat detector.

For more information, please contact:
Securiton
Representative Office Malaysia
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Email: asia@securiton.com.my

The New Cromwell Dual Helmet System

Today's operational demands on the Fire and Rescue Services have changed dramatically since the days of the cork fire helmet, giving the need to provide increased levels of protection for personnel involved in fire and rescue operations.

It is generally accepted that less than a third of all 'call outs' to the Fire and Rescue Services require the need for a structural fire fighting helmet. Other incidents not requiring this type of helmet include road traffic accidents, woodland fire fighting, water rescue, urban search and rescue and industrial incidents such as confined space rescue operations.

To meet these requirements HELMET INTEGRATED SYSTEMS LTD. (HISL) has developed its new Cromwell dual helmet system featuring two helmet shells that can be integrated into one.

The base helmet – the Cromwell ER1 – is for Level 1 emergency and rescue operations that do not require a structural fire-fighting helmet.

The ER1 can also be used by paramedic, water rescue and civil defence personnel and is fitted with an internal goggle and a connection for optional ear defenders. In addition the helmet can be configured for specialised operations such as heli-deck, coastguard, air sea rescue and public security.

The Cromwell FR2 with an integral full face shield, has an internal clip arrangement enabling it to be fitted to the ER1 in seconds, providing additional heat, flame and impact protection to the wearer when undertaking structural fire fighting operations.

The design of the modular internal connection for the two helmet shells ensures that there are no connections on the outside of the helmet that are susceptible to potential impact damage, or heat load.

The FR2 can also be fitted with integral communications, neck capes and SCABA facemask fixing points.

The Cromwell helmet is manufactured using the latest moulding techniques and materials and has abeen developed to meet the requirements of the planned UK Fire Services Integrated Clothing Project (ICP).

The new helmet is also designed with reference to published international anthropometrical data relating to both male and female fire fighters, and rescue personnel, across a range of ethnic groups, ensuring that the helmet will be suitable for international use.

HISL, the Hertfordshire UK based, ISO 9001 approved manufacturer of the new Cromwell, supplies most of the UK Fire Services with its Cromwell F500 and F600 fire helmets and is the leading international supplier of aircrew helmets for military and commercial aircraft.

HISL is able to offer sample helmets for evaluation and trial to interested fire and emergency service users.

For more information, please contact:
Helmet Integrated Systems Ltd.
Tel: +44 (0) 1462 478014
Email: bgaskell@helmets.co.uk

GET IN, GET ON, GET OUT WITH...

SOLOVISION

HANDS FREE
OR HAND HELD
THERMAL IMAGING SENSOR

WEIGHS LESS THAN 1.5lbs
•
UNIQUE FACE MASK SEAL ERGONOMICS
•
RAYTHEON MICRO BOLOMETER SENSOR

SOLOvision is a fully operational thermal imaging camera with Virtual Reality Viewing Optics. The light weight and unique ergonomic design enables 'hands free' operation.

The image is picked up through a centrally mounted camera. Even in the thickest smoke and with the face visor entirely covered, the image seen by the wearer remains undiminished in quality.

Thermal image is displayed to the wearer through augmented viewing lenses.

Suitable for use with all known breathing apparatus sets.

SOLOvision's outer shell comes with a lifetime warranty. Subject to terms and conditions.

Thermal Image displayed through VR Viewing optics

Solotic Imaging Camera

For information on all our fire fighting products or to arrange a demonstration, visit:
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Holmatro Rescue Equipment

Holmatro® DPU 31 PC Duo Pump: light AND quiet

Holmatro introduces the DPU 31 PC Duo Pump – Personal Power® which has been developed to meet the demand for a light and silent duo pump for the simultaneous operation of two rescue tools.

With a **weight of only 25 kg** and an **excellent centre of gravity** the DPU 31 PC Duo Pump can easily be carried by one person only. Most countries' occupational health and safety regulations state that one person is not allowed to carry objects heavier than 25 kg.

Another important feature is the **low noise level of 68 dB** at 1 m distance. This is more comfortable for the victim. It also provides a better workplace for the rescuer because it is easier to communicate at the rescue scene. The pump has an eco mode switch: when connected tools are not used the engine automatically switches to eco mode for a very low noise level and fuel consumption.

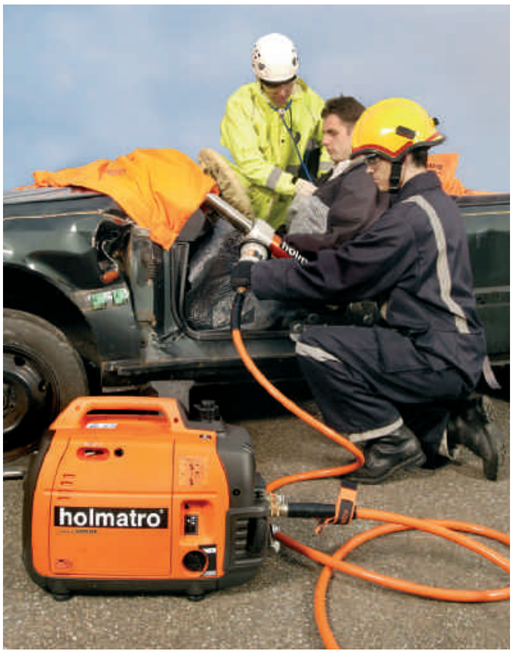
The DPU 31 PC Duo Pump has **LED lighting** above the valve block which allows for easy identification of the pump location in the dark. Furthermore, it facilitates coupling and uncoupling of the hoses.

The pump is also equipped with **gauges** at the front for easy checking of oil and petrol levels. The hydraulic oil contents of 2490 cc is sufficient to operate two rescue tools at the same time.

The new DPU 31 PC Duo Pump is standard equipped with Holmatro's new revolutionary **CORE™ Technology.** This technology is a turning point in *speed, ease and safety* of operating hydraulic rescue tools. In short, CORE™ Technology means that rescue tool and pump are connected with **one single hose-in-hose system.** Instead of the traditional separate pressure and return hoses, the CORE™ system consists of a high-pressure inner hose **inside** a low-pressure outer hose.

For the DPU 31 PC Duo Pump and other duo pumps equipped with CORE™ Technology this means that you only need two hoses instead of four to connect two tools to the pump. Every connection of a hose to a pump and tool means 2 times coupling instead of 4, and 2 times clicking dustcaps together instead of 4. With a duo pump this means **a saving of 8 times 'coupling and clicking'!**

A traditional rescue system requires the rescuer to switch the pump (valve) to neutral before changing (disconnecting and connecting) the rescue tool is possible. Since DPU 31 PC Duo Pump is equipped with CORE™ Technology this enables the rescuer to change the tool while the hose is 'under flow'; the pump is running and the valve is always selected. It is no longer necessary to change the tool at the pump. On the contrary, the rescuer can change his tool any time, whenever the circumstances require and without delay, even without releasing pressure at the pump. This means that the person standing near the pump for this purpose can perform other rescue tasks. Working with CORE™ increases the rescuer's flexibility, saves time and is much easier to handle.



New Holmatro® DPU 31 PC Duo Pump with low noise level of 68 dB, more comfortable for victim and better workplace for rescuer

Some other unique features and benefits of CORE™ Technology are:

- free rotating couplings (360°): CORE™ hoses can be rolled and unrolled much easier and quicker than a traditional hose. It is therefore impossible for a CORE™ hose to get twisted.
- the user is never exposed to more than 25 bar: high-pressure hose *inside* low-pressure hose
- half as many couplings and dustcaps than with a traditional dual hose system: time-saving
- no pigtail hoses anymore; a CORE™ hose gets coupled directly at the tool, so the rescuer can couple the tool in any position.
- CORE™ hoses are reinforced with state-of-the-art multi-layered Kevlar (no steel): kinking of hoses is not possible. **APF**

For further information,
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4940 AA Raamsdonksveer
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Email: info@holmatro.com
Website: www.holmatro.com

Pacific Helmets New Zealand have just released their new F9 “Firebreak^3” multi-function helmet

The design is based around the recognition that for most urban crews wearing a full structural helmet all the time, is over-kill for 90% of use. But when you need it you need it, so Pacific have introduced a lightweight (700 gms approx.) base helmet that urban or rural crews can wear at all times, including travelling to call-outs. This helmet is personal issue, and can be fitted with helmet mounted torch, radio headset or ear protection. It can be a cap-style for RTA rescue, or bushfire shape with wider brim, or even a paramedics helmet. All versions come with lateral impact protection for head protection in appliance crashes.

Only if the incident is a structural fire, would the second-level shell be dropped onto the Level 1 providing additional thermal, impact and face protection. No tools are required, and it is just as easily removed. Combined weight around 1350 gms. Normally this shell would be stored in the truck and not be personal issue.

Designed primarily for the Australian/NZ markets but expected to have wide appeal in many countries, this helmet is currently completing certification to AS 1801 (base helmet) and AS 4067 (structural helmet).

There is also a third level of protection available. Because there are some ultra-hot fire scenes and helmets get severely damaged in hot-fire training schools, an over-shell with sacrificial but re-useable surface is available so that gear can be protected from unnecessary grime and damage.

First production available early 2006.

For more information, please contact:
Pacific Helmets
Email: sales@pacifichelmets.com
Website: www.pacifichelmets.com

New rechargeable safety torch from Wolf

WOLF SAFETY, the leading manufacturer and supplier of torches and portable lighting for use in explosive atmospheres, has launched the first in its range of high-tech ATEX approved rechargeable torches.

The robust, yet compact, ergonomically designed torch weighing only 325g, a fraction of the weight of other competitive safety torches with a similar performance, incorporates a high efficiency 4-watt halogen bulb, offering two levels of light output and three to seven hours light duration.

State of battery charge is indicated with a bar of high intensity red LEDs which go out one by one as the battery charge diminishes. Towards the end of discharge, the beam flashes off repeatedly, warning recharging is required.

Chargers are available with ‘Quick’ (2.5h) or ‘Standard’ (8h) charge rates, configured to run from vehicle voltages, or mains with a suitable transformer. A unique feature of the charger design is the single handed ‘snap-in; snatch-out’ torch holder, designed to give the dual function of secure torch retention but also quick release, ideal in emergency situations.

Wolf Safety’s new Rechargeable Safety Torch, which is ATEX Approved for use in Zones 1 and 2 explosive gas and dust atmospheres, also carries *e ib IIC T4* approval code, which complies with Home Office TB1/1997 breathing apparatus for firefighters.

Low maintenance, quick component replacement, easy to use switching – even with gloved hands – and an IP67 rating, are other significant product benefits supporting the claim that this torch currently represents the best in rechargeable safety torch technology.

For more information, please contact:
Wolf Safety
Email: info@wolf-safety.co.uk
Website: www.wolf-safety.co.uk

SPENCER®

Evacuation systems

Spencer developed a complete line of Evacuation Chairs and systems, outlined on the new website Website: www.evacuationchair.net

Why

The September 11th events changed the world for ever but have also been an opportunity to revise evacuation and first-aid procedures as never before. The truth is that the request for evacuation is a less probable necessity in case of a terrorist attack than in that everyday life, like during natural disasters, gas leakages, chemical disasters, black-out or fire.

September 11th taught us also that, during an emergency evacuation, assistance is necessary not only for the disabled. In many cases, assisted evacuation may become a necessity due to severe disabilities, age or advanced mental and/or physical stress. It is a reality that today logistic emergency operators recognize the value and the importance of products which render evacuations much more efficient.

Spencer’s Solution: Skid Series

The most relevant technical/aesthetic novelty of this article is the adoption of passive caterpillar belts which effortlessly glide downstairs, with an elevated level of security.

On landing, the constructive geometry of the unit transfers all weight on the main wheels to allow turning and movement. Moreover, the Pro Skid version is equipped with front AND rear telescopic handles which allow upstairs transport. A careful examination of the whole chair will reveal a seat that has been very carefully studied; aesthetically and in its conceptually free styling.

The aggresivity has been achieved by the mixing of technical requirements. For example the tortuous conformation of the welded frame or the obvious originality of the seating posture. The precocity of the aesthetics is underlined by the distribution of the angles, the backrest that can be telescopically inclined, the adjustable headrest and the handles for transportation that can also be detached from the chair itself.

Innovative design and the maximum of security possible when in use, make the new Skid Series an absolute novelty within the environment of evacuations and transport.

For more information, please contact:
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Haix-Schuhe

Professionals need professional footwear

Today, modern footwear systems are able to offer more than only protection to the foot by means of a steel toe cap and a steel mid-sole. High-performance functional footwear should be adjusted to the wearer's tasks and the associated occupational hazards.

A balanced foot climate does play here a very important role. Especially anatomical points of view are not considered in a norm but are very important to avoid long-term damages to the human body as far it it is technically possible.

Good functional professional footwear should therefore not only protect from incoming moisture but also have systems which absorb foot perspiration during the daily usage and transport the occurring foot perspiration outside by means of membrane and conditioning system, as for example the **HAIX®-Climate-System**.

To reduce the daily pressure which affects the feet by body weight and equipment, the footwear should be designed in a way that the weight is absorbed during treading and the arising energy is converted into kinetic energy. The right outsole does play a special role here. It has to support whilst reproducing the natural rolling movement of the human foot, work anti-skid and have features that ease the wearer's tasks. For this, foot and boot has to unite. The choice of the correct shoe size and the anatomic shape forming of the inner shoe have a particular importance.

If the inner side of the shoe corresponds to the anatomical form of the human heel as far as possible, foot and boot can unite. The shoe becomes then the flexible foundation of the human body. It protects him, eases his tasks and avoids, as far as possible, long-term health damages.

To guarantee all these characteristics during the whole lifespan of the boot, it is an important precondition to select quality materials. Here, the correct choice of leather and its processing is decisive. Only leathers that are worked to keep their shape for a long period of time can base and support the foot. This of course affects the price. HAIX®, the German producer of functional footwear, does produce footwear with these required characteristics. The article Fire Hunter convinces among other products.

This fire fighting boot meets even the hardest requirements. For optimal comfort, this boot is equipped with the **HAIX®-MSL-System.** By injecting PU foam it is attained that the boot is waterproof, that the foot is cushioned from heel to ball during going and standing, and that upper, insole and outsole are connected durably. This high-tech functional boot is equipped with **waterproof leather** and the **GORE-TEX® membrane**, the **HAIX®-Climate-System** and a **rubber toe cap**. It is antistatic according to **DIN EN 344/345**. With its rubber outsole having a marked tread, it is solid when standing, in the country, when standing on ladders, and it is extremely nonskid.

A **penetration proof insole** worked into the sole protects the wearer from hurtful impacts from below. The sole distinguishes by a **marked heel front**, is **oil and fuel resistant** and **non-marking**. The basis for this perfect functional boot is as for all articles produced at HAIX® the knowledge of the usage, the operational area and the daily strain.

Accurate workmanship, technical know-how and using innovative material as the GORE-TEX® membrane combined with other strictly controlled raw materials, create practically orientated products on which one can fully rely in every situation. APF

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D-84048 Mainburg
Germany
Tel: +49 8751 86 250
Email: info@haix.de
Website: www.haix.com

In this helmet, even men can multi-task!

You urban guys know what it's like.

Every callout, you go kitted in full structural gear. 90% of the time you don't need it, but when you do, it's essential. But you probably don't wear your helmet in the truck when, in fact, speeding to a callout is one of the highest injury risks you face.

Pacific have the solution.

The all new F9 Firebreak³

New Zealand Patent Pending

USAR Rescue

Bushfire

Structural

Ultra-Hot Fire and Training

Level 1:

- Compact 700 gram personal-issue Kevlar base helmet.
- Available in a variety of shell shapes to suit all needs.
- High comfort trampoline harness, multi adjustable, sizes 50 – 64cm.
- Certified to AS1801 Type 3, with added side-impact protection.

Level 2:

- Kevlar structural shell converts Level 1 helmet to structural helmet.
- Simply clips on and off, literally, at the drop of a hat - no tools required.
- Non-personal issue - carry it in the truck until needed.
- Certified to AS4067.
- Combined weight lower than current Pacific F3 Structural Helmet, and a good deal lighter and more comfortable than those of our competitors.

Level 3:

- Optional sacrificial re-useable thermo Kevlar shell.
- For hot-fire training, oil fires or any other ultra-high-temperature situation.
- Designed to protect you and your gear.

Accessories: Fully interchangeable accessories between all Levels including torch, face shield, earmuffs, hands-free radio headset, etc.

We're saving the best news for last: Buying this multi-function helmet can be more cost effective than equipping a whole brigade with a mix of USAR, bushfire and structural helmets. Just ask us for details.

Now, back to that multi-tasking...

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Email: sales@pacifichelmets.com

Pacific Helmets (Australia) Pty Ltd • Sydney, Australia
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Email: sales@pacifichelmetsaust.com

PACIFIC NEW ZEALAND

Pacific F9™

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Safety without compromise.

www.pacifichelmets.com

D-Tec Limited

VSD – the ultimate fire detection solution

VSD, or Video Smoke Detection, has, since it was developed in the late 1990s, established itself as the fastest and most accurate technology for the early detection of a fire with pinpoint exactness. Managing Director, Ian Moore, explains how the system works and where its future lies in fire detection.

VSD is a camera-based fire detection system, which is used extensively in lofty and voluminous areas that traditionally have been a challenge for fire safety professionals. It works by utilising standard CCTV images that are analysed by image processing software, which looks for the particular 'pattern' that smoke produces. By programming the software to look for the anticipated smoke over a specified area within the camera's image, an exceptionally fast response can be assured. Once smoke has been detected, VSD alerts the operator, as well as giving a visual representation of the smoke on the system's monitor.

There is no doubt that VSD is the most appropriate system for a number of buildings. Power generation halls; warehouses; atria; historic buildings; tunnels; cold stores; onshore and offshore petrochemical installations; aircraft hangars; and shopping centres all vary in height, size and airflow. They require a system that detects the smoke at its source, and does not wait for the smoke to reach the detector before raising the alarm. This is precisely what VSD does, and so provides an early warning that is impossible with conventional detection.

Among the most frequently asked questions is; how close does the smoke have to be before it is detected by the CCTV cameras? Theoretically, the system can detect a fire on the moon. However it would need a clear night, a five-kilometre smoke plume and a camera with a three-metre lens! In everyday terms though, the appropriate camera and lens, in relation to the protected area, are determined when the site survey is carried out. The camera lens and line-of-sight determine the viewing area, and establish the distance between the potential fire and the VSD cameras. As a rough guide to detecting a fire, ten percent of the VSD monitor height needs to register smoke. This sensitivity can, however, be increased or decreased by programming.

It is often cited as a worry that pollutants, which are part of the normal environment, will affect VSD's ability to detect smoke. This is not the case, as the system is engineered to accommodate the environmental pollutants by adjusting the smoke detection parameters. During the commissioning period, unwanted alarm phenomena is engineered out, and smoke tests are performed on each camera to ensure that the system is working effectively in all likely environmental conditions.

Greater accuracy – faster response

VSD has many advantages over conventional detection systems. These include its accuracy regarding the precise location of the smoke; that it requires only basic operator training; and that its use reduces the potential risk to personnel by remotely viewing the incident.

A single camera provides a large area of protection that can be separated into easily identifiable zones, so reducing the areas that need to be physically searched. The cameras can be wall-mounted, allowing VSD to protect areas that cannot be easily accessed. Cost saving is also significant, especially if a large area needs to be protected. This is most evident where there are suitable, existing CCTV cameras, as many of the installations are a combined CCTV security and fire detection system.

VSD can also help reduce false alarms. As part of both the design survey and commissioning phases, areas of potential false alarms are identified, and programming steps are taken to eradicate them. An on-site trial period will identify any further problems not evident at initial set-up, and these can then be engineered-out during the final commissioning stage.

Another of the most commonly asked questions is; can smoke be detected in low light conditions? In short, for the system to detect the smoke, it must be 'visible'. In low light conditions this can be accomplished with relative ease using low-light CCTV cameras and/or infrared illumination, depending on the light levels envisaged.

Integration with existing systems

There is very little involved in integrating CCTV and VSD, providing an effective dual-use for the cameras. As long as the existing cameras are the fixed type, of adequate quality, and cover the area that is deemed to be at risk, all that is required is a standard analogue video feed from each camera. This can be "T-Tapped" from the back of the multiplexer unit to minimise installation work.

It is also fairly simple, and very economic, to integrate a VSD system with a fire detection system or building management system. As VSD provides freely programmable, volt-free outputs, compatibility is ensured with all systems that accept an input. In this instance, each camera can have its own output or a summary output, and this is programmed to meet the customer's requirements. VSD also provides fault outputs to the required system for monitoring in the same way. **APF**

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Very Large Transport Aircraft (VLTA) Airbus A380

Fire Protection Needs for Post-Crash Conditions

By Joseph A. Wright, Sr.

ARFF Technical Services, Inc.
Red Lion, Pennsylvania

The principal objective of a rescue and firefighting service is to save lives. The equipment chosen, the number and selection of personnel, and the training received need to be geared towards this goal. This objective may include requirements for direct interior firefighting intervention. For this reason, the preparation for dealing with an aircraft accident or incident occurring at, or in the immediate vicinity of, an airport is of primary importance because it is within this location that the greatest opportunity to save lives exists.

The possibility of, and need for, extinguishing a fire that can occur either immediately following an aircraft accident or incident, or at any time during rescue operations, must be assumed at all times. The first rule of airport fire fighting is to protect the passenger evacuation areas. Agents selected must exhibit good fire knockdown and extended burn-back resistance for this reason. The most important factors bearing on effective rescue in a survivable aircraft accident are the training received, the effectiveness of the equipment, and the speed with which personnel and equipment designated for rescue and firefighting purposes can be put to use.

Any airport rescue and firefighting service should be equipped, trained and prepared to handle the largest aircraft anticipated to come into the airport. This training and equipment should all meet international consensus standards such as National Fire Protection Association (NFPA) and International Civil Aviation Organization (ICAO) Standards and Practices. In the United States these

ARFF vehicles will need an Extended Reach Elevated Boom

airports would also have to meet the index requirements of the Federal Aviation Administration's (FAA) Federal Air Regulation (FAR) Part 139. This will require the construction of a state-of-the-art training facility that will emulate these large aircraft. Airports that are projected to receive services of the next generation Very Large Transport Aircraft (VLTA) like the new Airbus Industries A380 need their fire fighters to receive training at facilities of the size and scope of this new aircraft. This aircraft will have the potential of carrying 600 to 1000 passengers traveling on three levels of occupancy, and should there be an accident, it will be of the highest magnitude and will test the tactics and strategies of the any Airport Emergency Plan.

Airports located at Los Angeles (California), Seattle (Washington), Orlando (Florida), Singapore, Bangkok (Thailand), Paris (France), London (England), Sydney (Australia), and New York (USA) will potentially be just a few of the cities which airlines will want to utilize the capabilities of the Airbus A380 to provide long range flight service. There will be many other locations throughout the world where the advantages of long range, plush interior accommodations, and large passenger capacities will dictate the A380 as the aircraft of choice.

Airports that are projected to receive services of the next generation Very Large Transport Aircraft (VLTA) like the new Airbus Industries A380 need their fire fighters to receive training at facilities of the size and scope of this new aircraft.

This new aircraft will be very complex, and will have many areas in which disorientated passengers may become trapped due to the aircraft being filled with smoke. Should a post-crash fire develop, the flow of escaping passengers may take quite a bit more time then the proposed 90 seconds evacuation time. Some variations of the aircraft may include sleeping quarters on the lower deck for Business and First Class travelers. The above illustration depicts the size and growth from narrow body aircraft to the new Airbus A380 series of aircraft. When viewing the cutaway drawing of the Airbus A380 aircraft, it can be seen that should an accident occur with some impact to the airframe, many of the compartments of the aircraft could be damaged and require a detailed confined space search and rescue approach to passenger extrication.

Currently there is no requirement to have airport fire fighters trained in confined space rescue procedures. In the United States there is not a single training facility that provides for second level aircraft fire fighting or rescue operations at this time. Fire fighters need to train using the tools and equipment necessary while replicating second level responses.

The Airbus A380 has a high percentage of new composite materials. These materials will bring with them new dangers and problems for fire fighter protection. New strategies and tactics for fire fighting, medical evacuation, post-crash cleanup, and accident investigation will require a higher degree of protection and concern from the related dust and debris. High energy cold foam can be used to temporarily seal the dust and provide a degree of protection while passengers are removed and other emergency services are provided. The thick foam when applied can be built up on the surfaces of debris to prevent the movement of fine particulate dust into the air.

Emerging technologies should be integrated into the Aircraft Rescue and Fire Fighting (ARFF) services rescue and firefighting strategies, as well. Among these technologies are elevated extendable booms equipped with systems that can pierce

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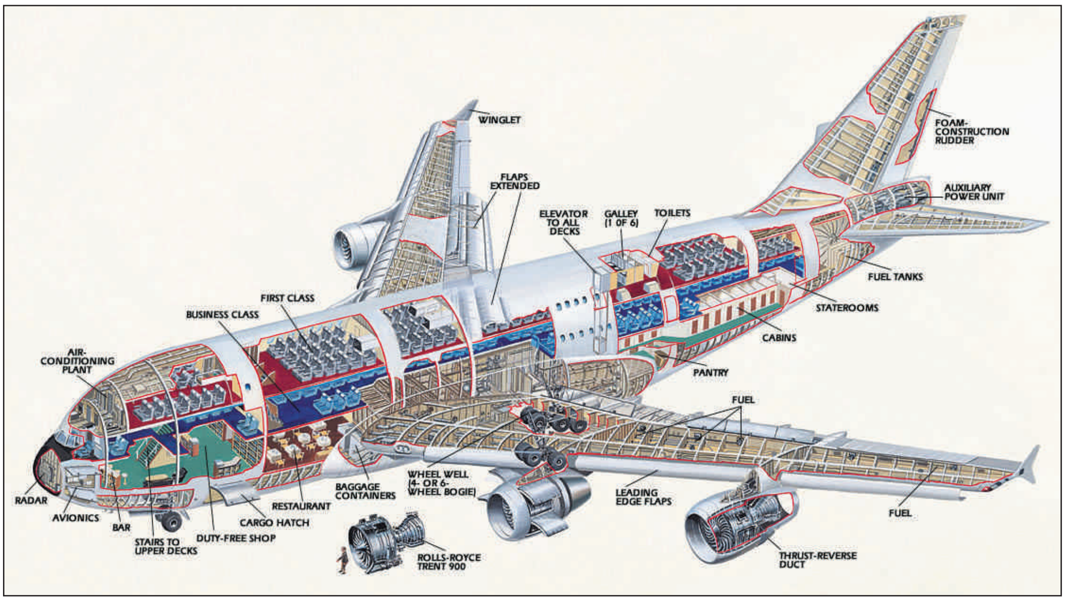
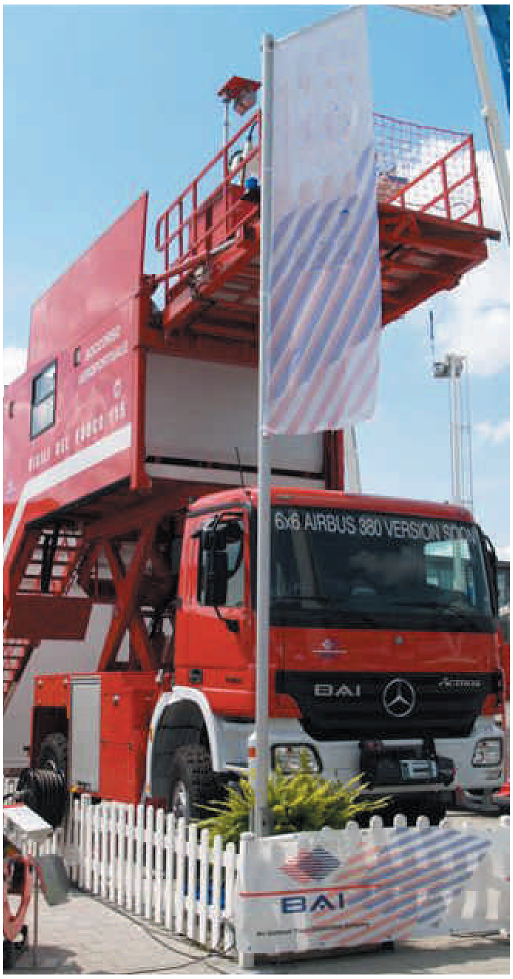
Cutaway drawing of the Airbus A380 courtesy of Airbus Industries, France



the skin of the aircraft cabin to deliver agent to the various levels of the burning interior early enough to increase passenger survivability rates. These elevated extendable boom devices can also deliver agent low to the ground, or they can be extended for high-reach applications. Firefighting attack teams, which currently lack the specialized equipment necessary for the Airbus A380, will have to work off of handheld ladders, climbing as high as 27 feet (9 meters) above the ground to reach the aircraft. Not only is this difficult, time-consuming, and dangerous, but it has not proved to be effective.

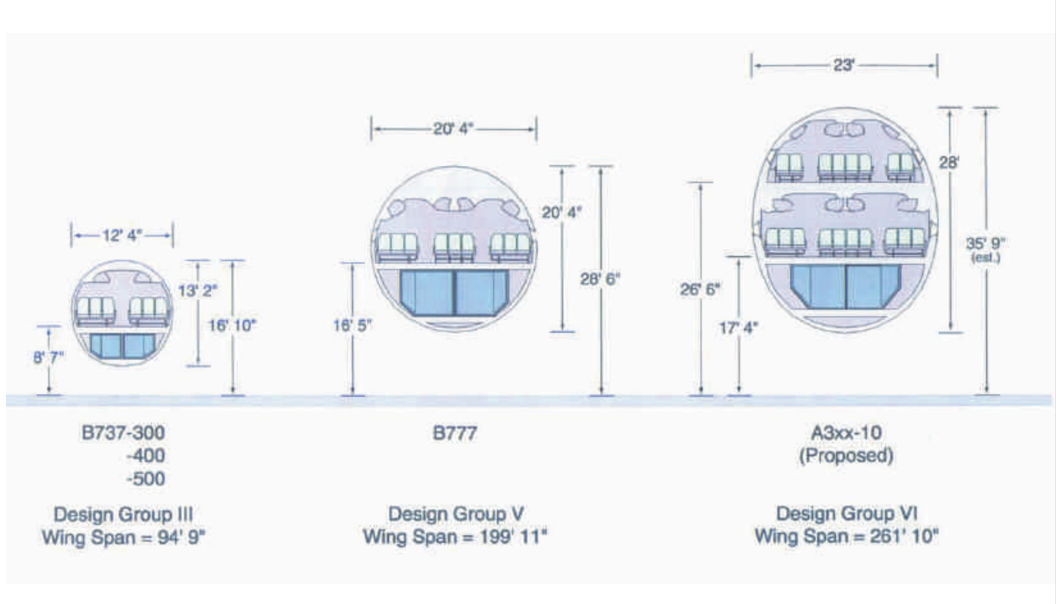


Second Level Airstairs Vehicle

Ten emergency slides will extend out from each side of the Airbus A380 aircraft approximately 30 to 40 feet. Passengers will be coming down from both of the major occupied levels of the aircraft simultaneously, thus it will be difficult for fire fighters to gain early entry into the cabin or position necessary passenger egress equipment such as rolling stairways near the door openings to make a timely interior entry. High winds could easily lift slides from the ground making them unusable. A lot of manpower will be needed to assist evacuating passengers at the bottom of the slide areas. Early suppression of interior fires can be accomplished if the proper equipment is available. Thus it is important to have the ability to pierce the aircraft with an extendable elevated boom fitted with a piercing device which will allow the early intervention of fine mist water spray into the cabin areas should the need arise.

A new device such as this to service the

The new extendible booms provide for two high-capacity monitors which can be individually controlled at the midpoint boom position and at the high elevation position of the fully extended arm. In addition, the piercing nozzle device is now hydraulically assisted to aid in piercing the heavy skin of the Airbus A380 or other similar aircraft.



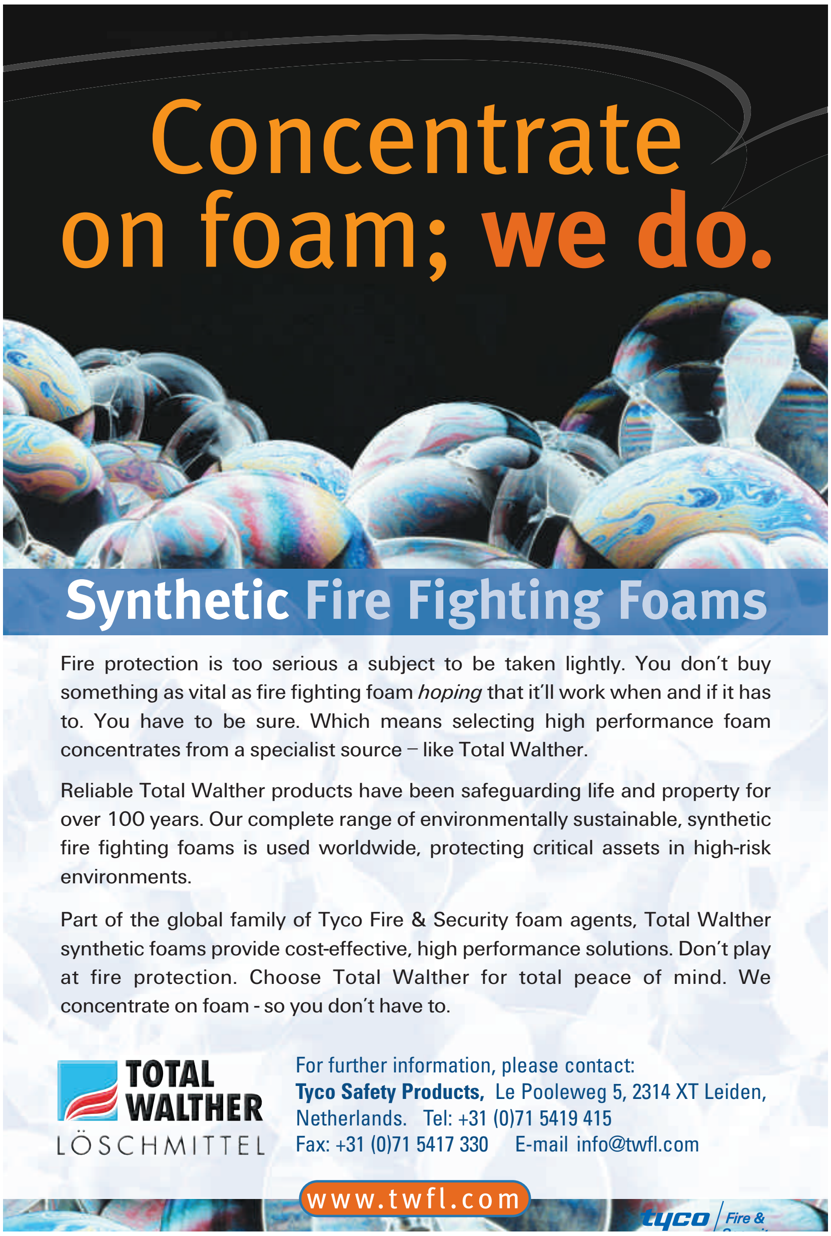
The new designs will be taller than existing designs

firefighting needs of the Airbus A380 has recently been developed. The height of the Airbus A380 required the reworking of the current design to allow the reach to be extended to 65 feet. The new design can be positioned at the open second level doorway of the A380 aircraft or can pierce above the window levels on the second level of the aircraft.

With both upper and lower evacuations slides coming off the aircraft from both sides of the aircraft, it was important to be able to have substantial vehicle standoff from the vehicle's position and side of the aircraft. The new design of extendable boom has the greatest standoff distance of any elevated boom manufactured far for this airport rescue purpose. A 34-foot reach from the front of the vehicle's bumper to the side of the aircraft should allow positioning in close quarters to the evacuation slides and allow the elevated boom to reach up, out, and over slides without interfering with the emergency operation of the slides. This was an important factor in the consideration to develop the new elevated extendable boom system.

Technical advancements have improved operation of the extendable booms. These improvements include three extendable boom arms to provide increased reach and upgraded computer controls to reduce extension times and provide operators with ease of operation and positive feedback. The new extendible booms provide for two high- capacity monitors which can be individually controlled at the midpoint boom position and at the high elevation position of the fully extended arm. In addition, the piercing nozzle device is now hydraulically assisted to aid in piercing the heavy skin of the Airbus A380 or other similar aircraft. The new design can also be fitted with a optional manifold system to allow hand lines to be run from the area of the piercing nozzle. This will greatly reduce the problem of getting hand lines into the interior second level should there be a need for this strategy.

Improvements in thermal imaging, multiple agent capability, and vehicle designs are keeping pace with the new challenges of VLTA deployment. However, all of this technology also requires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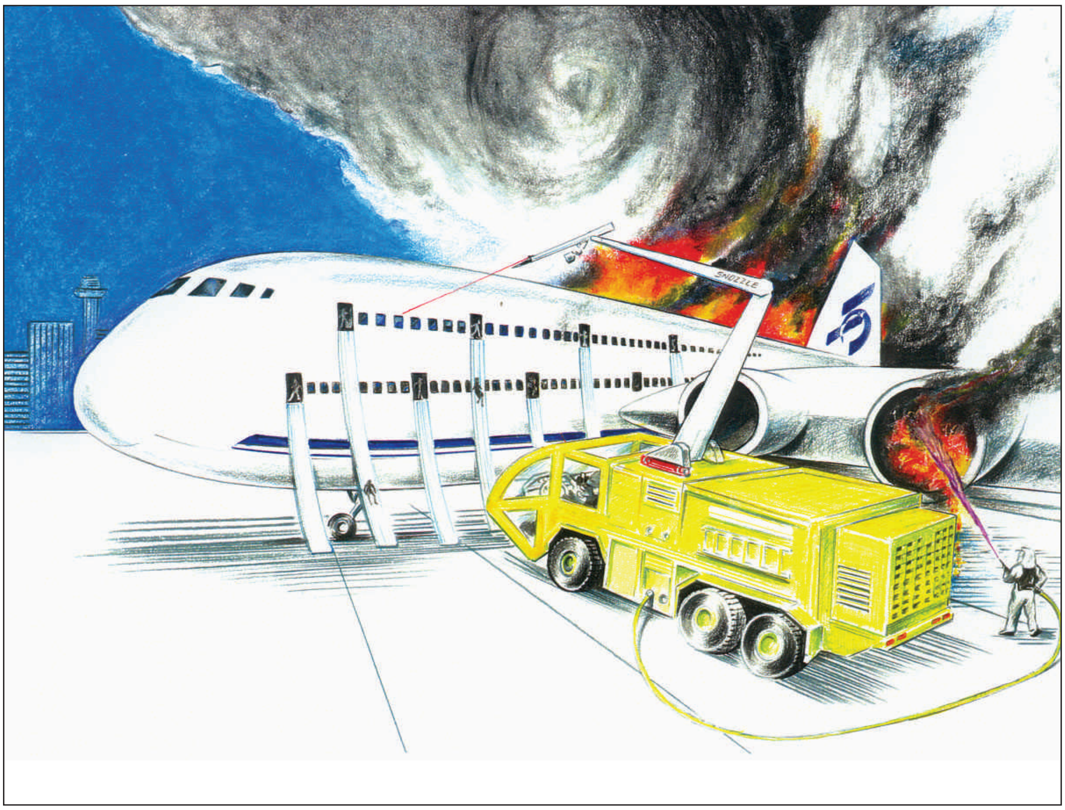

Extended Reach Elevated Boom

proper training. Computerized simulators are now available to aid in this training. This is a unique device which allows the vehicle operators to train and hone their operator skills at several levels of proficiency without leaving the fire station. The computer simulator trainer will come includes a computer with preloaded software and console controls which match the specific truck installation. The simulator can be delivered up to 90 days before the actual truck arrives at the fire station. This allows firefighter to have the advantage of learning the controls and operation of these specialized components before the real systems arrives. This reduces vehicle use for training purpose and lowers maintenance cost by having proficient operators.

Computerized Simulator Trainer with Matching Joystick Controls to Specific Truck Installation

Due to the large number of evacuation slides and potential passengers to be evacuated from the Airbus A380 aircraft, specialized evacuation-assist vehicles will be needed to replace slides that fail due to fire exposure. Fire fighters will need mobile stairways with off-road capability to assist in evacuation and to serve as platforms from which tools can be provided to perform positive ventilation procedures to remove toxic smoke from the aircraft. Fire personnel must be able to drive these mobile stairways safely off-road, yet the stairways must be able to reach more than 27 feet (9 meters) into the air.

Fire fighters will need mobile stairways with off-road capability to assist in evacuation and to serve as platforms from which tools can be provided to perform positive ventilation procedures to remove toxic smoke from the aircraft.

In conclusion, the Airbus A380 presents certain challenges to the ARFF community due to its size and the large passenger capacity. Specialized training facilities which match the size and scope of the aircraft will need to be built. Special advanced composite materials will require unique fire protection strategies and tactics. New rescue vehicles that can provide both an escape route for fleeing passengers and a work platform for firefighting equipment will be needed. Early suppression of interior fires will require higher reach extendable booms with piercing nozzle capability which can work over and away from emergency slides and evacuating passengers. Finally, there will be a great need for additional manpower to assist passengers and hold slides at ground level under high wind conditions. **APF**

Joseph Wright was the Program Manager for Aircraft Rescue and Fire Fighting Research for the Federal Aviation Administration and retired after 34 for years in the year 2000, from the FAA's William J. Hughes Technical Research Center located at the Atlantic City International Airport, Atlantic City, New Jersey.

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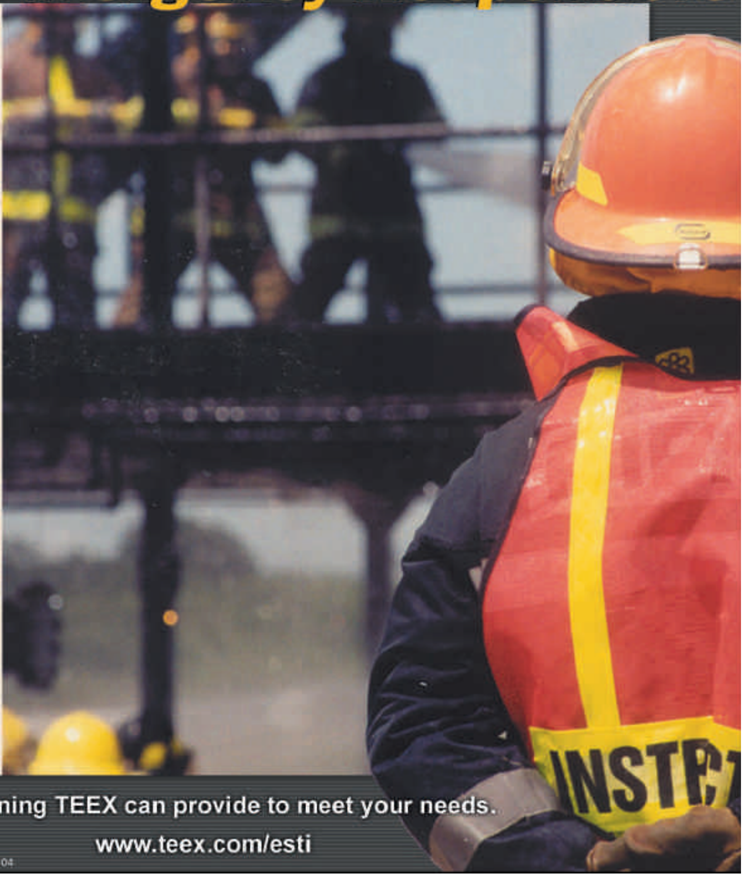

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Firefighter training in Sumatra, Indonesia. Pic courtesy of Hale Europe

Portable Pumps

The portable pump has always been an integral part of the firefighter's equipment, it is a flexible unit playing many roles – supplying water from open sources to the main vehicle pump, as a back-up to the main pump, as a pump to relieve flooding and also as an independent pump. In the latter role a portable pump of suitable capacity is ideally suited to be fitted to a locally produced tanker and thus produce an economic yet versatile fire fighting truck. Another use of the portable pump is for feeding fire hydrant systems, for example the following photographs show pumps installed in a hydrant system protecting an oilfield in Sumatra.

By David Burton

Hale Products Europe

There are increasing demands for a portable pump to be lighter, more compact and yet still give a powerful and reliable performance. In addition the space available in appliance compartments becomes more restricted as fire trucks are used in a wider variety of situations and need to carry a greater variety of equipment to cover all potential problems. In the UK the equipment must conform to the appropriate Home office standards, in the case of portable pumps – JCDD/30.

In European countries there are the PREN standards for portable pumps to be considered, these primarily address health and safety aspects as well as important pump features, such as operator controls and instrumentation.

Although lightness and compactness are high priorities, durability and a high build quality must not be compromised. The pump must perform immediately and at the full rated performance every time this is needed. In a fire or rescue scenario there is no second chance!!

The engine must be simple to operate and once running the pump should be easy to prime and run. Hand start and the easier electric start are often selected by the customer. Features such as pump priming can be either hand pump, exhaust gas, piston or vane type depending on client preferences.

A wrap-around stainless steel frame ensure that the unit is not easily damaged yet at the same time is easy to manoeuvre. On the larger portables, either integral wheel assembly for local manoeuvring or a separate detachable wheel assembly for longer transportation are often available as factory supplied options. These frames are normally fitted with adjustable handles that can, in some cases, be extended to ease carrying the unit.

The power source for a portable pump is typically a lightweight petrol or diesel engine of the smallest physical dimensions and weight but yet reliable and easy to operate. These are often air cooled at the lower end of the power scale – typically <20BHP.

Bigger engines are needed for the larger capacity

Pic courtesy of Hale Europe

portable pumps but again weight and size are key features that need to be considered. With these larger engines it is often necessary to move to closed circuit water cooling where a water-to-water heat exchanger replaces an air-to-water radiator system and thus gives significant weight savings with no reduction in cooling efficiency. Closed circuit cooling systems are preferable as these do not discharge water into the ground around the pump and thus cause the area to become subject to waterlogging or freezing depending on the inclement weather.

The Malaysian fire service receive training on a consignment of pumps recently delivered.

Due to the inherent weight of diesel engines, it is unlikely that portable pumps above the smaller sizes can really be called portable units but when mounted permanently on a small forestry type fire truck the diesel weight becomes less of an issue. Another option is to mount the diesel engined pump on a small trailer, thus ensuring mobility without compromising the required performance.

As a contrast the smallest and most portable pumps are the floating type, designed for use in remote rural areas where rivers or ponds are often the only source of water. Typically these pumps feature a single cylinder, 2 stroke engine mounted on a high-strength polyethylene float and can produce up to 500 L/min discharge. With the pump directly connected to the water source no suction hoses are required and priming is automatic.

Floating pump. Pic courtesy of Hale Europe

Fuel available is also an issue – petrol units are lighter than diesels but if diesel is the only available fuel then the choice is made for the client.

Petrol power can be by two or four stroke engines but the ease and simplicity of four stroke fuelling cannot be underestimated.

Servicing of the pumps should be straightforward and all the necessary spares inexpensive and readily available. The Manufacturer's warranty is expected to be at least 12 months duration.

Safety is as always a high priority with particular attention focusing on the engine exhaust that must be fitted with a guard to protect the operator from high temperatures.

In addition to these features, portable pumps now incorporate a high level of instrumentation, controls and optional lighting masts. The lighting mast is a useful addition as often, particularly when relaying, the portable pump is located away from the main area of operation and likely to be located in an area where night time illumination is unavailable.

In the not too distant future portable pump design and manufacture will be subject to the European standards devised by the CEN (Comité Européen Normalisation). A technical committee, CEN/TC 192, comprised of leading European pump manufacturers has been devising these standard. The current definition of a portable pump is given as –

"Portable pumps are motor pumps designed for firefighting which can be transported by hand to the site of operation and which are driven by a combustion engine. Portable pumps are intended to be not permanently mounted in firefighting and rescue service vehicles.

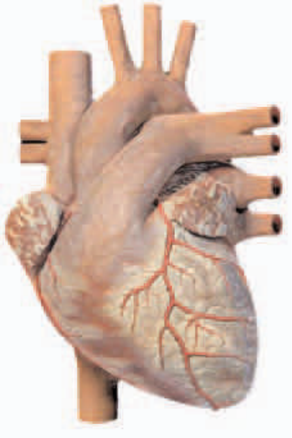
This European standard deals with significant hazards, hazardous situations and events, arising from portable pumps used as intended or arising from conditions foreseen by the manufacturer or the manufacturer's authorised representative. It addresses the construction, setting, and operation of the portable pump"

Of course a great number of these points have already been addressed by pump manufacturers as an integral part of a continuous product improvement policy.

It is essential for the pump manufacturer to consult the end user from the early stages of new product development to ensure the pump meets, and where possible exceeds, the firefighter's requirements. The pump manufacturers and the main professional organisations (UK based) – Institute of Fire Engineers, Chief Fire Officers Association and the FIRESA (fire suppliers association) – are regularly in contact through conferences and exhibitions for feedback and discussion on pump specification improvement. In general, the overall strategic aim is to produce lighter, more compact but also more powerful pumps.

The performance and standard of portable pumps available for firefighters today continues to improve mainly due to the combination of customer's expectations, improved technology, competing manufacturers and the introduction of exacting European standards. There are over 2,000 portable fire pumps in action with UK fire brigades alone, it remains a key and powerful part of the fire fighters armoury to ensure flexibility of operation under demanding situations. APF

Pumps that lives depend on



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Removing the door: one of the ways to create space to get early access to the victim in case of injuries that require treatment and monitoring throughout the extrication process

Vehicle Extrication Techniques

There is a need for a good understanding of the various basic generic extrication techniques to perform an extrication rescue successfully. All too often we get involved with developing extensive and often complicated extrication procedures, when what is really required is the ability to carry out a certain amount of basic generic extrication techniques effectively and efficiently to get the job done.

By Brendon Morris

If we break down the procedure required for a successful extrication job we very quickly notice that all extrication jobs consist of a series of basic extrication techniques. It is for this reason that I feel so strongly about providing those doing this sort of work with educational material focused on how to efficiently and effectively get such basic techniques done. When a rescuer has the ability to do these various techniques well all they have to do is use a certain combination of the techniques depending on the situation to get the overall extrication job done.

If we start at the very beginning we have to firstly consider stabilisation of the vehicles involved. Good stabilisation will allow for the rest of the extrication job to be performed safely and effectively. Stabilisation is often referred to as the foundation on which a successful extrication can be performed. With this in mind it makes all the sense in the world to do it well. Having said this we have to remember that doing something well at an extrication job cannot mean taking too much time to get it done. Stabilisation needs to be performed quickly and without too much delay, as most of the rest of the extrication cannot begin until it is done. This highlights the need for those that have to do the stabilisation to be familiar with the basic generic techniques that can be used. By understanding these techniques well the job of stabilisation can be done properly the first time without taking too much time. This will greatly increase the success of the overall extrication job. If the job is done properly the first time valuable time can be saved by not having to fix all the problems with the stabilisation later.

After stabilisation has been performed the next

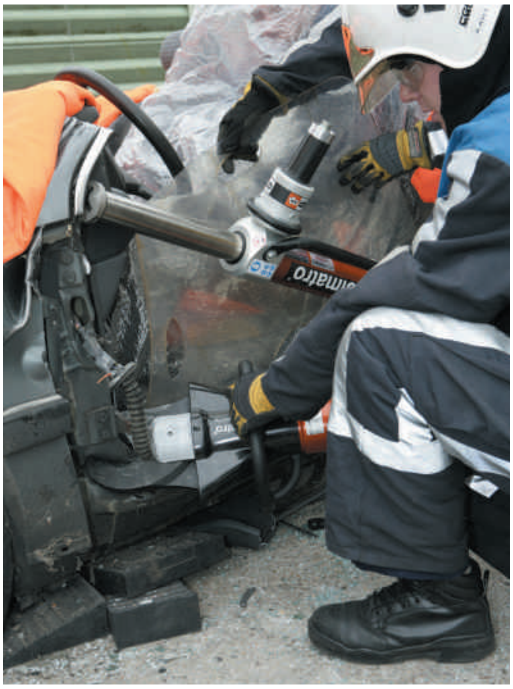
Make sure that the vehicles involved are stabilised properly; this saves time and will allow the rest of the extrication job to be performed safely and effectively

step is to gain access to the victims entrapped. Glass management often forms an integral part of this but equally important is the ability to create openings into the deformed vehicle as well as the creation of space around the victims. Space creation and victim access early allows for more effective medical management of the entrapped victims. This is exceptionally important when victims may have critical injuries that require treatment and monitoring throughout the extrication process. To be able to get space creation done all the rescuers wielding the rescue tools need to be very comfortable with techniques such as door removal, or in some cases perhaps even a B-pillar rip. Of course having the right kind of tools to do these techniques is important but always remember that all the equipment in the world won't mean a thing if we don't know how to use them properly and safely.

Very often the next major extrication consideration is going to be what opening to remove the victim out of. Bearing in mind the likelihood of internal injury as well as the fact that extensive movement of the body during victim removal can easily worsen injury, the answer to this question has to be: the biggest hole we can make. Not having to do any more extrication work and merely removing the victim through the small opening created by removing the door is often very attractive to the rescuer. However with the understanding of the potential for worsening injury as discussed above we need to wherever possible remove the roof and extricate the victims up and out of their entrapped position. This use of upward movement is far less likely to lead to any worsening of the victim's condition. Of course to do this type of victim removal the roof has to be removed. Here again the need for good knowledge of basic extrication techniques is critical for a successful removal of the victim. In order to do this, techniques such as roof flap or complete roof removal are required.

In many cases merely creating a large opening such as removing the roof is not enough. Entrapment of frontal victims especially the driver is often caused by displacement of the dashboard and steering wheel down onto the victim. This type of entrapment, especially seen with frontal impacts, requires dashboard displacement to allow for removal of the victim. Again a generic extrication technique such as a dashboard roll is required. This can be a tricky technique to use if the rescuer is not familiar with the various ins and outs of the procedure. A perfect example of this is the importance of the sequence in which this technique must be performed. With the use of more extensive reinforcement of the frontal dash area in vehicles now on the roads the correct sequence has become more important than ever before.

The sequence I am referring to above is the way in which a ram should be positioned in the opening of the front door before the relief cuts are made into the base of the A-pillar. The reason for this is the fact that relief cuts into the base of the A-pillar before ram placement may well lead to the dashboard and steering wheel moving further down onto the victim. This will certainly not make the victims condition any better and should obviously be



A CORE™ system allows for changing under flow: the rescuer can change between the ram and cutter without considering having the system put into neutral to allow for this

avoided at all costs. Of course knowing the technique is only one side of the coin. Equally important to being able to perform the technique effectively is the fact that the rescuer has to have the best equipment for the job in his or her hands. For instance, in the case of a dash roll, having a hydraulic system with a change-under-flow possibility (such as the CORE™ system) will greatly increase the efficiency of the technique. With such a system the rescuer will be able to change between the ram and cutter without ever having to consider having the system put into neutral to allow for this. Even in the case of a dual outlet pump that is able to run two tools simultaneously, there will always be the need to change between the cutter and the ram.

In conclusion we always have to remember that having a good working knowledge of the basic techniques used in extrication is paramount to success. The only way to reach this place is to practice. Remember we should not be using the actual collision scene for this practice. We have to find the time to practice away from the rescue scene. Also make sure to take a look at the techniques on paper or on the computer screen occasionally. This will always be beneficial especially where extrication jobs are not so common.

For a step-by-step explanation of the techniques discussed in the article take a closer look at Holmatro's Vehicle Extrication Techniques Training Programme. The basis of this educational programme is a compact, yet comprehensive 100-page book that is translated into various languages including Chinese. A series of 8 posters with step-by-step explanations of basic extrication techniques by means of many clarifying illustrations and a CD-ROM with many animations and videos complete the programme and make it highly suitable for (classroom) training, reference or to brush up your personal skills. Apart from a main focus on various extrication techniques the programme also deals with related topics, such as safety, equipment handling, new vehicle design and construction, and vehicle stabilization. For more information see www.holmatro.com **APF**

Brendon Morris is the Training Manager at Holmatro Rescue Equipment in The Netherlands. Brendon has been academically trained in both medical and technical rescue. His extensive experience in the extrication of victims from vehicles was generated in South Africa, where he was employed as Rescue Paramedic in the service of an ambulance and rescue team. He was also attached as a teacher to the Department of Emergency Medical Care & Rescue of the Durban University of Technology. In his present position he trains fire brigades, rescue services and training schools all over the world. Through the exchange of knowledge and experience during these training sessions, Brendon is kept abreast continuously of the latest developments in the field of technical rescue.

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Fire door testing. Pic courtesy of Chiltern International Fire

Passive Fire Protection Systems

Insuring Their Role in a Balanced Fire Protection Design

A balanced fire protection design incorporates both active and passive fire protection systems working in concert to minimize the effects of fire on life safety and property. Active fire protection systems, such as automatic suppression and detection systems, detect, alert, control, and extinguish a fire in its incipient stages.

By Arthur J. Parker, P.E.

Senior Fire Protection Engineer

Hughes Associates, Inc.

Baltimore, Maryland, U.S.A.

Passive fire protection systems, such as fire resistance rated boundaries, through-penetration fire stop systems, and fireproofing materials, limit the spread of fire (and smoke) beyond the room or area of origin by containing the fire. Building codes recognize the importance of this balanced design approach by requiring minimum fire resistance ratings for structural building and separation elements (floors and walls), and the installation of active fire protection systems (in most occupancies). The intent is to limit the risk to life and property to an acceptable level by requiring somewhat redundant safety systems.

Passive fire protection systems must be inspected at the time of installation to insure the highest level of initial reliability. A regular inspection and maintenance program assures continued reliability of the passive fire protection system over the life of the building. Initial inspections are typically provided for in the building code through special inspections or requirements for the installation of certified resistance rated assemblies. Regular inspections and maintenance are not typically required by the building codes, rather by the insurer of the building, with the frequency depending on the insurance underwriter and/or the type of occupancy.

The only installed passive fire protection material currently subjected to special inspections in the U.S building codes is sprayed fire-resistive materials (SFRM). Other products, such as thin-film intumescents, through-penetration fire stop systems, gypsum wallboard, concrete masonry units (CMU), fire doors and glazing materials are typically only subjected to inspections by the local building official after installation as a system or assembly before final building sign-off is obtained. In order to function as required, each of these products must be installed per the certification requirements and the manufacturer's installation instructions.

Inspection of installed SFRM are conducted using field testing standards which verify that the minimum SFRM density, thickness, and adhesion/cohesion (bond strength) performance parameters have been met. The American Society for Testing and Materials (ASTM) and the Association of the Wall and Ceiling Industries – International (AWCI) have developed test standards for conducting field tests of SFRM installed on building structural steel to verify the performance parameters specified by the certification agency have been met. AWCI has also developed a test method for conducting field testing of the installed thickness of thin-film intumescent materials.

Currently, U.S. building codes do not include special inspection requirements for verifying the installation of field installed through-penetration fire stop systems. However, ASTM has developed a standard practice which provides guidance for conducting field inspections of installed fire stop systems to insure their installation is in accordance with the certification requirements and the manufacturer's installation instructions. Procedures for conducting destructive tests on a small percentage of each unique type of installed fire stop system per floor or minimum floor area for larger buildings, or witnessing the new installation of these products are provided. The incorporation of this test method into the building codes may occur in the near future, thus providing another standardized inspection method for common passive fire protection materials. In general, all SFRM, thin-film intumescent, and through-penetration systems rely on random testing by independent third-party organizations, hired by the building owner or general contractor, to verify their proper installation.

For other types of passive fire protection systems, such as floors, walls, doors, and glazing materials where a fire resistance rating is required, the inclusion of a recognized third-party certification mark is required to be provided on the product(s). On gypsum wallboard, the inside surface of each board is stamped with a label providing manufacturer information and the type of wallboard. For concrete masonry units (CMU), certification paperwork must be attached to all materials, insuring only tested and certified CMU is being used.

Fire doors are required to be provided with an approved and permanently affixed labele showing the name of the manufacturer, the name of the third-party certification agency, and the fire protection rating of the door assembly. When specific temperature limits are required, such as when the door is installed in an exit enclosure, the maximum transmitted temperature end point is also required to be included on the label. The label is required to be applied at the factory or location where fabrication and assembly are performed to insure the door delivered to the job site was manufactured under strict quality control procedures and was not field altered.

Pic courtesy of Cafco International

Glazing materials are required to bear a label indicating if the glazing assembly can be used as a fire resistance rated assembly (such as in a wall), a fire door assembly, or in an opening. This label also insures that the assembly meets the applicable fire resistance requirements, performance in accordance with the hose stream requirements (if required), and the fire protection rating period. This information is required to be permanently etched into the edge of the glazing material to insure that any material delivered to the job site will bear an indelible identifying mark indicating that it is a fire rated material.

Passive fire protection materials play an important role in the balanced design process. The use of consensus developed test standards, field testing procedures, certification programs, and routine inspection and maintenance program insures, the proper installation and operation of passive fire protection materials can be assured for the life of the building. **APF**

Pic courtesy of the Association of Specialist Fire Protection

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- 'Study of Crowd Movement' by **Dr. Siu-ming LO**, Associate Head & Associate Prof., Department of Building and Construction, City University of Hong Kong
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Collapse Rescue

Numerous recent disasters, in several parts of the world, should alert us to the fact that people are going to be trapped under buildings and other structures in the foreseeable future. The very nature of our technologically sophisticated and "growing taller" society continually increases the likelihood that this sort of calamity will occur. Current construction trends and population increases seem to continually expand the risks as people move further up from the ground. With the advent of the "High-Rise" buildings comes the very real concern of a "building collapse".

By Clark Staten, EMT-P

Emergency Medical Services

Emergency Response & Research

Each year the buildings seem to get taller and taller and "Mother Nature" or her creations seem to take their toll of more and more of them. Earthquakes, hurricanes, tornados, and other weather phenomenon have shown a far greater capacity for destruction, than society has for building structures that will withstand the weather or earth disruptions. Both weather and ground patterns have the potential for mass destruction of both structures and the people that they contain. Manmade destructive forces also play a major role in the cause of building collapses.

Nature of the problem

Building collapse rescue is an often complex and confusing situation. It will frequently involve large numbers of specialized rescue personnel and equipment that might not be generally be recognized as being part of a normal rescue organization. It should also require a combination of a variety of technical rescue skills and an advanced knowledge of building structures and materials.

When a building collapses, it generally does so in one of two ways. The building can be thought of as having "exploded" or "imploded". The primary difference between the two types of collapse is the direction of force as it applies to the materials contained in the structure. It will also assist in a determination of the density of the debris that is involved in the rubble.

With implosion, the building will collapse into itself. It is a technique that is used by demolition specialists to minimize the spread of debris when purposely demolishing buildings. This type of collapse is likely to be caused when interior weight bearing structures lose their integrity and

subsequently "pull" exterior walls into the centre of the mass. The density, and generally the depth, of debris are greater when a building is said to have imploded.

In the case of explosion, either caused by an outward rush of force caused by natural, mechanical, or chemical forces, the building will collapse in an "outward" direction. It is likely that the debris will be more wide spread in the vicinity of the collapse, and that it could be of lesser density and depth. A tornado or hurricane can "scatter" building parts for several hundred feet or even farther, when it causes a building(s) to collapse. It is possible that victims could be "buried" under debris a greater distance from the centre of mass.

Horizontal versus vertical rescue

Most rescue experts agree that building collapse extrication must be a process of vertical removal, rather than horizontal movement or reduction. The safest way to remove debris from someone that is buried should involve carefully lifting the debris from above the victim and continually "shoring" the sides of the entrance hole or excavation to ensure against additional collapse. This is a method that is consistent with common practices used for "trench rescue".

In the case of building collapses, the magnitude of the shoring efforts and the type of equipment necessary to perform the rescue may be very different from normal extrication. In order to facilitate vertical removal of debris, it may be essential to quickly locate and utilize various types of "cranes" and other types of "overhead lift" capabilities. It is strongly suggested that every rescue system have previous knowledge of and training for the use of heavy construction equipment. Emergency dispatchers should have access to a list of construction companies and other businesses that could provide this type of equipment on a 24 hour a day-seven day a week basis.

The importance of careful overhead lifting of debris, rather than vertical movement, cannot be emphasized enough. As many as one third of all building collapse victims, that are rescued, are found in spaces created by the way that building

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materials generally fall. Most of the collapse configurations that occur (lean-to, A-Frame, tent, pancake) create "voids" in which people may be trapped and remain alive. Vertical movement of debris will normally further collapse the sides of these "protective spaces" and can result in additional deaths of those that might have been rescued.

General building collapse rescue guidelines

1 As one might expect, immediately after a collapse, the debris of the building is very unstable and prone to additional movement. Rescuers must assess the nature of the scene and the pattern of the collapse before entering onto a pile of rubble to insure their own safety and that of those potentially buried in it. Shoring may be necessary to prevent movement, before attempting rescues.

2 Gather as much information as is possible at the onset of the incident. "Intelligence" regarding the last known locations and activities of those believed to be in the structure will greatly assist in developing a plan for recovery efforts. Concentrate your preliminary efforts on areas where people were last seen or known to be. It is suggested that a "Command" person be designated to interview those that may have escaped the collapse, were eyewitnesses, or were in the building and rescued early in the effort. Obtain a list of the people normally in the building, if one is available.

3 After ensuring rescuer safety and minimal movement of the debris, send small-organized teams to the top of the pile and systematically search the surface in specific grids. Use barricade tape and markers to visually demonstrate the areas that have been searched and those that could potentially contain victims. As many as one half (½) of all building collapse survivors have historically been rescued near the surface of the debris and early in the effort. Concentrate your efforts on those areas that are believed to be the last known locations of people, when the collapse occurred.

4 CALL for Help!! It normally will be necessary to activate some sort of disaster plan for large scale building collapses. This type of rescue is very manpower intensive and may require large numbers of

As many as one third of all building collapse victims, that are rescued, are found in spaces created by the way that building materials generally fall. Most of the collapse configurations that occur (lean-to, A-Frame, tent, pancake) create "voids" in which people may be trapped and remain alive.

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extrication and medical personnel. Call for the "overhead lift" capability that you will need, as soon as it can be determined that people are missing or still trapped. Remember . . . it is likely you will need some method of "cutting" concrete and the steel reinforcing bars ("Rebar") that are contained within most modern buildings. (i.e. torches, hydraulic cutting tools, saws).

5 Explore visually, or with mechanical devices (closed circuit/fibre optic T.V.), all possible "voids" that are open or can be reached by removing surface debris. It is suggested that, at approximately every hour on the hour, all work at the site be shut down for a few minutes to listen for calls for help. During that period, sound detection devices can be used to "listen" for movement or sounds deep within the debris. Call for "Search Dogs" and handlers, as they are available in your area or region. (Have the equipment and dogs on a dispatcher's resource list with the heavy equipment contractors/operators)

6 Continue to remove debris . . . carefully and vertically, searching each "void" or entrance to a "void" as it becomes available to the rescuer. Consideration must be given to the fact that the rescue effort is NOT over until EVERY reasonable effort has been expended. Expect these types of rescues to last days . . . especially when multiple buildings are involved (earthquake, avalanche, etc). People have CONTINUALLY and HISTORICALLY been found alive many hours and days into the rescue. Have command, media relations, and logistics officers plan for a multiple day operation when people are still suspected of being missing and their bodies have not been recovered.

7 Great care must be taken when a person is located, either dead or alive, to ensure that additional collapse doesn't occur in the area of their entrapment. Rescuers should use their hands and small tools to remove the remaining debris surrounding a person. The victims condition may dictate the speed with which rescue efforts progress. Consideration should be given to early application of Military Anti-Shock Trousers for viable persons that have "crushing" injuries. Preparation and the beginning of application of them should take place as soon as the entrapment permits. Several instances of complete hemodynamic collapse and death have been noted upon release from confinement. Intravenous solutions can also be administered by qualified EMS personnel as extrication continues. Caution should be urged in the use of morphine or other painkillers.

8 DO be prepared for the emotional and psychological implications of the incident. Prepare early for Critical Incident Stress debriefing sessions for rescuers, victims and families. It is strongly suggested that mental health professionals and crisis intervention be made available to the families of those believed trapped, at the earliest opportunity. The stress of protracted digging, discovery of disfigured remains, odd smells and sights can affect even the most hardened of rescue professionals. Supervisory personnel may want to set aside a special place for families and psychological care near to, but off of the rescue site. To do otherwise will invite charges of insensitively, and probably prompt the families to attempt to enter or stay in the rescue area.

9 Relief for both supervisory and field rescue personnel must be forthcoming. Even though most rescuers will insist in continuing their efforts for many hours, they lose a large part of their effectiveness after 18-24 hours or less. Ensure that all rescuers eat and rest at frequent intervals, as

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circumstances permit. Prepare to (and do) call in off-duty or mutual aid personnel, as they are needed. Stage all extraneous units in a planned way and avoid having more personnel on-site than can effectively work at one time.

10 During long term or at major rescue operations, expect extreme "media" coverage, including the national and international press. Be prepared for analysis and commentary of your every move. It is suggested that this scrutiny can be somewhat averted by appointing a designated Public Information Officer (P.I.O.), and by planning and giving frequent press briefing and updates. Include "front-line" rescuers and technical experts that you may be being utilizing in the effort. During the early stages of the event, give these briefings hourly in an area adjacent to the site and provide as much information as you can actually verify. As the length of the rescue increases, plan a morning and afternoon news conference. It is suggested that someone monitor press activities on a constant basis, in order to be able to anticipate the questions and concerns of the media. Be as forthcoming as possible, without compromising the integrity of the rescue operation, the victims, or the families of the victims.

11 Anticipate the need for additional resources that you haven't thought of prior to this event. Be prepared to obtain architectural drawings of the building(s) affected. How about gas mains, water pipes, or electrical services that are disrupted? You may want an aerial perspective of the scene . . . do you know where and how to get overhead photos of the collapse? How are you going to feed "hundreds" of construction workers, rescue workers, families, and others, who may be there for days? Who's going to pay for what? Will you need a city/county-purchasing agent on-site to approve the immediate purchase of your needs? Ensure that you have planning and logistics officers who can anticipate these needs and fulfil them within a moments notice. Often . . . the difference between what is perceived as a completely successful rescue and a "disorganized" one is the quality of your planning and the careful execution of your contingency plans.

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tyco Fire & Security

12 Particularly in multi-story buildings are prepared for the possibility and likelihood of underground or cave- type rescue procedures. This type of specialized rescues requires those experienced with climbing (ascending and descending) manuvers and the use of technical rappelling methods. Each rescue team (minimum of two rescuers) going "underground" should have a safety rope attached and be in constant communications by radio with the surface. They should also possess a minimum of three viable light sources. Hose rollers and other types of "rope slip devices" must be used, as to avoid the sharp edges of concrete that will abrade normal rescue ropes.

13 IT AIN"T OVER UNTIL IT'S OVER! Generally speaking, you will be criticized for any early termination of rescue efforts, if there are still people missing or bodies not recovered. A rule of thumb says it's over when everyone is accounted for or the "field is cleared" (of debris). Practical application says that you will probably scale back the aggressiveness and scope of the effort after several days of rescue, but that you should remain aware of the fact that people have been successfully rescued alive after as much as twelve (12) days . . . buried in the rubble of an earthquake. In the March, 1992 Turkish earthquake, a 22-year-old nurse was pulled from beneath a building collapse after eight days. She was also quoted as saying that she had been "talking with her two friends", who were also buried, for several days after the collapse . . . until she "didn't hear them anymore". The thought of someone remaining buried alive for several days should be enough motivation for most rescuers to continue with their efforts until every possible hope has been exhausted.

14 Establish on-scene (and separate) communications (Radio, Data, telephone) connections and expect problems with being able to coordinate with many differing agencies. It might be suggested that a "common" disaster frequency might be designated in preplanning sessions for the initial response to the incident. Once on-scene, the Incident Command team may need to establish several different "nets" of units or agencies and have a common dispatch centre at the command post. Anticipate the need to constantly communicate with construction workers (crane operators) and their supervisors, and probably a dozen other agencies that you never thought of. Also remember that the need for coordination with local and state police may become necessary for crowd/access control and other purposes. Often police agencies will become involved in securing the remains of fatal victims in a temporary morgue at the scene.

The thought of someone remaining buried alive for several days should be enough motivation for most rescuers to continue with their efforts until every possible hope has been exhausted.

15 EXPECT THE UNEXPECTED! Regardless of the thoroughness of your contingency planning efforts and the diligence of all of the people involved in the rescue, something will become a problem that no one has anticipated. This is just another opportunity to demonstrate the quality, commitment, and dedication that comprises the makeup of most rescue organizations . . . let the improvisional ability of the fire-fighters, EMTs, paramedics, police officers shine through!

Conclusions

One of the most difficult, emotionally draining, and technically complex types of rescue can be a building collapse incident. The keys to a successful rescue are pre-planning, practice, and perseverance. By learning more about this increasing commonplace event, we can be better prepared to save lives and alleviate the suffering of its victims. APF

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Pic courtesy of Pelican Products

Torches and Portable Lighting

By Christopher Marino

Enlighten your work life

Before Edison's wonderful electric light bulb was invented, if you wanted to illuminate the darkness you had to carry a naked flame with you. Can you say "Fire Hazard"? Fortunately, Hubert Conrad in 1890 invented the battery powered Torch and over the years it has evolved to match the requirements of individual groups of users. The modern torch now provides the user with an array of choices from the type of lamp, shape of the beam, construction materials and approvals for hazardous work environments. The aims of this article are to compare differences between various types of technologies used in modern torches, and discuss this vital tool in the context of workplace safety.

'Classic gases' vs. new technologies

Professional lighting manufacturers have been striving for years to develop the brightest possible torches. They have struggled to produce lamps that not only create impressive amounts of light but also last for a reasonable period of time. The classical Edison Incandescent lamp utilizes a metal filament (usually tungsten) through which current is drawn to heat up the metal and generate light. To prevent the filament from oxidizing, it is suspended in an environment devoid of oxygen. Usually, this environment is achieved by surrounding the filament with a glass envelope and replacing the air inside with either a vacuum or an inert gas. In recent years it is these inert gases, such as Halogen, Krypton and Xenon that have allowed the manufacturers to achieve greater amounts of light output and also allow the filament to burn at higher temperatures. By using these 'classic' gases the results are superior to a simple vacuum lamp as they offer a white collimated beam of light that provides a better tool for professionals such as plant maintenance, fire fighters and law enforcement. In general terms, Halogen and Krypton would be more powerful than Xenon, but this sentence is not always right. It also depends on many other components and the design of the torch. The difference in the whiteness, or color temperature, between torches is due to the type and quantity of gas inside the glass bulb of each torch.

Another important factor in the making of a professional torch is the lamp reflector. The shape and texture of the reflector has a marked effect upon the quality of the beam that is generated by the lamp. Ideally, an efficient reflector should collect all of the light generated by the lamp to create a beam free from shadows and dark rings. Compare the beam quality of high-end products from premium torches manufacturers with cheaper lights and you will see a distinct difference!

The batteries used to power torches have also evolved over the years, with manufacturers striving to provide the maximum amount of energy inside the smallest container. Torch manufacturers want high voltage and amperage-hour capacity in order to create the brightest and longest lasting torches, and the battery manufacturers have answered the call with new, powerful, primary alkaline and lithium cells, and rechargeable nickel metal hydride (NiMH), sealed lead acid (SLA) and nickel cadmium (nicad) battery packs. With each passing year, the duration of batteries increases while the size of cells shrinks.

Probably the most significant advancement in the field of lighting technology has been the Light Emitting Diode (LED) invented by Nick Holonyak in 1962. This single invention has created a revolution throughout the lighting world. The basic advantages of the LED over Edison's incandescent lamp are greater efficiency of light per watt, lower cost of replacement of the lamp, longer battery life and greater impact resistance. However, due to the relative infancy of the technology, while LED light output is not yet as bright and intense as the current incandescent lamps on the market, millions of Euros are being poured into this area of research to resolve this shortcoming. LED torch manufacturers are currently being challenged to create innovative designs that maximize the output of LEDs, and this is resulting in torches that are not created equal . . . please read on.

The LED produces light by moving electrons through materials to create photons of light. The materials used to create the LED are organized into a "chip" and lie on a flat substrate. In contrast, the classical Edison filament hangs between to poles like a tight rope. By lying on a flat base, the LED is inherently more stable when subjected to an impact, which can literally mean the difference between life and death as we shall see later in the article.

The LED also creates very little heat compared to the filament and this aspect alone leads itself to a safer working environment, especially when used in a volatile atmosphere. This lack of heat means that more energy is converted into photons of light, whereas the filament lamp creates a tremendous amount of heat as the filament burns. This can lead to a surface temperature on the glass envelope in excess of 150°C (300°C) – enough to automatically ignite some volatile gases. Probably the most important advantage of the low heat an LED produces is that the lamp's life is upwards of 100,000 hours, compared to the 20 to 60 hours of a conventional torch lamp. As one can imagine, the combination of low battery consumption and long lamp life lead into a torch that rarely needs replacing. The effects on the environment due to a reduction in battery consumption are to be applauded, as is the reduction in battery replacement costs. However, the incandescent filament still has one significant advantage over the LED and that is the ability to create tremendous amounts of light by increasing the filament size.

One disadvantage of the LED has been the ability to focus the light emitted from the chip. Until recently, the only way that torch manufacturers could create a product that generated a reasonable amount of light was to package together many LEDs into a cluster. This approach created a soft wide beam that was fine for close up work but was not focused enough to throw light over distance or penetrate smoke or fog. This situation changed in 2003 with the advent of a new technology referred to as RECOIL LED Technology™ from Pelican Products. For the first time, an LED could produce the brightness of a classic incandescent lamp but with the longer burn time and lower operating costs of an LED.

Pic courtesy of Pelican Products

This new invention consisted of using one of the new generation of high-wattage LumiLED LEDs from Luxeon and directing the light back into a reflector, just like a lighthouse. This simple but innovative method captures nearly 100% of the light emitted by the LED, and then reflects it forward into a truly impressive beam of pure white light. Comparing this approach with a regular 8-LED torch, the resulting Recoil beam is 33 times brighter. With the new generation of Recoil LED lights producing comparable light output to incandescent lamps, yet with significantly lower operating costs, perhaps the "torch" is about to be passed from Edison to Holonyak. . .

Photo Technology

Comparing manufacturer's torches

In order to compare professional torches, the user should decide which features are most applicable to his work environment. Torches can be compared by reviewing light output characteristics, battery life, manufacturer's guarantees, lamp replacement costs, price and, most importantly for the health and safety market, hazardous location approvals. With respect to the measuring of the light output, manufacturers use Lumens and Lux. Lumens indicate the total amount of light emitted by the light source, whereas Lux measures the intensity of the beam at a distance – itself a function of the reflector. Choosing carefully which torch would better fit a user's expectations means that several manufacturers' torches should be compared for differences in brightness.

Some users will be concerned about the consumption of batteries and lamps. Probably the most popular reason for a torch being discarded is a burnt out lamp. With a life upwards of 100,000 hours, the LED torch rarely requires replacement. In addition, the low battery consumption of the LED torch will ensure that financial budgets are not eaten up buying batteries. Finally, the decision to purchase an LED light is kinder on the environment, as fewer batteries mean less waste.

Pic courtesy of Pelican Products

Some applications require brightness over all other considerations, and it is here that the incandescent torch reigns. For users requiring highly focused beams, such as firefighters and scuba divers, torches should be examined for beam characteristics and their ability to penetrate the environment in which they are intended to operate.

Portability and Usability

By their very nature, all torches are portable. However, market segmentation has forced manufacturers to create lights that match their user's specific requirements, of which portability is an important criteria. Many industrial users of portable lights are increasingly adapting to the hands-free approach of using headlamps and brackets that mount lights onto work helmets. Available in a wide variety of sizes and styles, headlamps and torch helmet brackets allow the user to focus light on a task while allowing them to use both hands rather than hold a torch.

Other users, such as fire fighters, like to attach the light to their equipment so that they can release it without fear of dropping the torch on to the ground. Such users look for torches equipped with rings and clips made from durable stainless steel.

A torch for every user

Depending on many users' requirements, lighting systems can vary a lot. When a torch needs to operate long hours, it is more efficient, in terms of cost, to use a rechargeable system rather than one with an alkaline primary battery. Workers operating in atmospheres with high temperatures should select plastic rather than metal torches, in order to avoid the excessive heating of the torch body. Finally, workers within hazardous locations need to make sure that their torches are safe and correctly certified by Safety Standards such as the ATEX Directive (in Europe).

Safety

Why are torches required to conform to safety standards? Though they seem to be small and innocuous, the lamp and the batteries inside can be a significant source of ignition when used in a hazardous and volatile environment. The lamp filament operates at a very high temperature and some gases will ignite if they come in contact with either the filament or even the glass envelope. The batteries themselves can be a source of ignition, especially if a short circuit occurs resulting in the generation of a spark. Even the body of a plastic flashlight can build up a significant static-electric charge, and some manufacturers metal plate their lights to prevent such build-ups from occurring. Such lights are typically referred to as "Zone 1/Zone 0" torches.

In order to prevent accidents, lighting systems need to be approved to certain Safety Standards, as mentioned before. There are several of them: Underwriters Laboratory (UL), Factory Mutual (FM), Canadian Standards (CSA), Urban Search and Rescue (USAR), Mine Safety Health Administration (MSHA), Australian Board of Approvals (AUS), etc. Notified bodies certify torches to ensure that they pose no threat of ignition when operating in hazardous locations. The notified bodies test the torches by subjecting them to worst-case scenarios. For example, the spark generated by a short circuit of the batteries is used to see if it will ignite a chamber of gases where the light is expected to operate. Only if the gases fail to ignite will the light be ertified for operation within that environment.

Critical Mission

It is imperative that a torch used by a professional such as a fire fighter or plant maintenance technician operates reliably in the field. The ramification of a torch lamp failing at the critical moment when a fire fighter enters a burning building needs no explanation. LED technology renders lamp filament failure, which is probably the most common mode of torch lamp failure, a thing of the past. In addition, the careful measurement of filament and LED temperature ensures that the user knows precisely in which hazardous environments the torch is safe for operation.

Pay Now or Pay Later

Nowadays one can find many cheap lights available on the market, but quickly after the low price has been forgotten, the true degree of quality will surface. As a manufacturer of professional torches, we recommend users to check the quality of a lighting system before buying it. By quality we mean, in general terms, brightness, tough materials and safety certifications. It is also important to consider the guarantee that the manufacturer offers. The length of that will determine if the torch will stand the test of time and extreme conditions.

Professional, high-performance torches are significantly more expensive than regular incandescent ones. Purchasing agents and individual buyers may not see the rationale in purchasing such expensive lights but over a period of time, the high cost of a professional, ATEX approved torch will typically be less than a cheap one.

Failure of the lamps is typically the reason that most torches are discarded. High performance Xenon-filled lamps must withstand significant internal pressure from the gas, which translates into longer lamp life. As mentioned earlier, the inherent long life of LEDs renders lamp replacement redundant and their low battery consumption rate adds to the savings.

Finally, the materials and design standards used to create torches that pass the various tests necessary for ATEX hazardous location approval ensure that the lights are built to withstand the rigors of industry. A buyer has the choice to pay now or pay later for another torch. . . APF

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Aspirating Smoke Detection Systems

Pic courtesy of Fire Fighting Enterprises Ltd

Aspirating smoke detection systems are designed to detect smoke at a very early stage, often known as the incipient stage, of a fire. They are used extensively in applications that posses a high inherent value. Typical applications include computer suites and historic buildings. Most conventional fire detectors are unable to provide as much of an early warning. These systems are significantly more sensitive than conventional detectors and allow site personnel to take appropriate action to minimize the effects of a fire. Fire Fighting Enterprises Ltd is in the unique position of being able to offer variants of both aspirating smoke detector systems and of the complimentary optical beam smoke detectors.

By Ian Steel

Fire Fighting Enterprises Ltd

The aspirating type fire detection system can vary in sensitivity, but comprises a number of the same key components, namely:

1 Sampling pipe
2 An aspirator, or fan
3 Cartridge filters
4 Smoke detectors

The sampling pipe work, of up to 100 metres per channel, is used to continuously draw samples of air to the detectors for analysis. Pipes can be ABS, UPVC, copper or stainless steel as appropriate. The drawn air is passed through the filter cartridge, which will eventually become contaminated with dust particles, thus reducing airflow. The filter elements should be replaced at six monthly intervals for optimum performance, and to eliminate false readings.

The sampled air then goes to the detection chamber where sensitive receivers measure the light scattered by any smoke particles. The light energy is converted to an electronic signal, representing the amount of detected smoke and this information is then passed on to a control system for reporting.

LASD – Laser Aspirating Smoke Detectors

The LASD, Laser Aspirating Smoke Detector, from Fire Fighting Enterprises, uses a much more sensitive detector than that used in typical point systems. A normal point detector can detect smoke at around 2.5% obscuration/metre whereas the Laser Aspirating Smoke Detector can pick up the traces of incipient fires at between 0.065% obscuration/metre and 6.5% obscuration/metre

The LASD units use one laser detector in a single channel configuration (LASD 1) or two laser detectors in a dual channel configuration (LASD 2). Combined with a simple pipe system, with holes drilled at regular intervals, a large area can be monitored by using sampling holes in the place of point detectors. The LASD 2 has two pipes, of up to 100m each, and can therefore cover twice the area of the LASD 1.

Pic courtesy of Fire Fighting Enterprises Ltd

The Laser Aspirated Smoke Detectors have been cost engineered to allow a much wider acceptance of this technology, which has previously been beyond most budgets. The LASD unit therefore provides a low cost, high sensitivity system where large numbers of point detectors would normally be specified.

A high performance aspirator is incorporated to ensure an even and constant flow of sampled air. The flow level is adjustable and is displayed on a ten-segment bar graph. Adjustments are also available for high flow, or low flow, thresholds. The constant flow monitoring circuit of the LASD enables the unit to indicate low flow caused by blocked sampling holes or blocked filters, or high flow caused by broken pipes or loose joints.

Three adjustable alarm level thresholds are available: Alert Alarm, Action Alarm and Fire Alarm and visual indications are given if these levels are exceeded. This allows the unit to be configured for its environment, such as dirty, inaccessible or confined areas. The levels are displayed on a ten-segment bar graph. This gives advanced warnings, or pre-alarms, before the final alarm activation.

To avoid false discharges of suppression systems, the LASD 2 can be configured to require both detectors to go into alarm. By utilising the two separate detectors this precludes the need for two separate systems. This is known as coincidence detection or "double knock".

The unit can be operated in either stand-alone mode, using the relays for control, or can be wired to an intelligent fire alarm panel, with control being affected through the communications from the control panel. The system is optionally IP65 rated allowing its use in many harsh environments, and where regular hosing is performed.

ASD – Aspirating Smoke Detector

There are many instances when the high sensitivity capabilities of the Laser aspirated smoke detectors are either not required or may even become a nuisance due to unwanted alarms. A solution to this unnecessary expense is the Fire Fighting Enterprises Aspirating Smoke Detector or ASD. Like its LASD cousin the ASD is available as either a single channel or dual channel variety and provides a solution in allowing the use of simple point detectors within an aspirating system.

The main difference between the LASD and the ASD is that the ASD is not delivered with laser detectors attached. The system can be fitted with analogue addressable point detectors, such as those provided by Apollo Fire Detectors. This may mean that incorporation into a pre-existing system may be more straightforward. By incorporating up to 2 analogue addressable point detectors the ability for either redundancy or mixed detection strategies is provided.

The ASD systems also use high performance aspirator and flow monitoring circuitry. The flow level is displayed on a ten-element bar graph with adjustments for high and low thresholds. Flow failure is reported to the central panel as a device fault on the primary detector.

The unit is very easy to install and uses a simple two button interface to ensure that the unit can be quickly configured, whilst the display gives a clear view as to the state of the system and any faults.

Advantages

The aspirating smoke detector systems, using either laser or analogue addressable point detectors, have a central unit that requires only basic maintenance. This unit can be placed where it easily accessible but the pipe system can be installed in places that have restricted access, such as under floor systems and ceiling voids.

They are cost effective, simple to install, easy to use and are suitable for a wide range of applications where unobtrusive, wide area detection is required. They are suitable for use in generally inaccessible areas and the in-built cartridge filter means they can be used in harsh and dirty conditions. The units also provide closed loop sampling whereby the exhausted air can be returned to the sampled area if required. This makes the unit ideal for vandal-proof detection systems, such as in a prison cell.

Complimentary Detection Technologies

Fire Fighting Enterprises is better known for its range of Fireray Optical Beam Smoke Detectors, which are available as either end-to-end or reflective variants. An end-to-end beam comprises a transmitter and a receiver at opposite ends of the area to be protected. The transmitter emits a signal, which is detected and monitored by the receiver. With a reflective beam the transmitter and receiver are effectively in the same unit (transceiver). The transmitter emits a signal that is reflected back to the receiver using a retro reflector positioned at the opposite end of the area to be protected.

A beam detector can provide detection coverage of up to 1500m^2, though full consideration needs to be given to correct installation. Beam technology is more suited to large open spaces where there is a clear line of sight, such as atria and stadia, where the pipe work of an aspirating system may be obtrusive.

Beams can offer some significant savings over the installation costs of alternative methods of smoke detection, especially when using the reflective variety, which only required wired installation at one end. They are also less obtrusive that alternative smoke detection methods.

Future developments in our beam technology will result in beams that are even easier to install and maintain and will be even more cost effective in use. APF

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Tactical Ventilation

Venting actions by on-scene firefighters, used to gain tactical advantage during interior structural firefighting operations

By Paul Grimwood

Pics by Harvey Eisner

Throughout the 1980s London firefighter Paul Grimwood presented several controversial papers and articles, based mainly upon his own operational research and experiences as a firefighter both in the UK and the USA, that closely examined structural ventilation practices as carried out by firefighters around the world. His proposed concept of 'Tactical Ventilation' (a term he originally introduced and defined in 1989 through his book FOG ATTACK) was to encourage an increased awareness of 'Tac-Vent' Ops and PPV and present a safer and more effective tactical process for the ventilation of fire-involved structures by on-scene firefighters, paying particular attention to the influences of air dynamics and fire gas formations. Following work with Warrington Fire Research Consultants (FRDG 6/94) his terminology and concepts were adopted officially by the UK fire service and are now referred to throughout revised Home Office training manuals (1996-97).

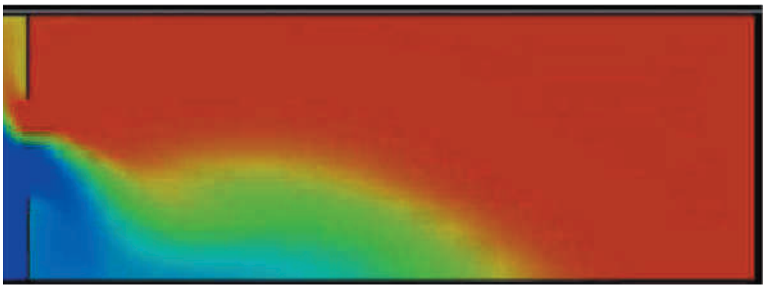
In 1984 he posed the question whether US style roof venting methods should be utilized at an earlier stage in the fire attack and discussed some previous UK incidents where venting may have helped. His thought-provoking five page article in 1985 described the tactical implications of using roof cuts to vent fire gases and discussed a wide range of tactical options used to create safer working conditions for firefighters and trapped occupants through the creation of openings in the structure. It was here, in 1985, where he first introduced and discussed the benefits of Positive Pressure Ventilation. In 1987 he called for a Home Office review of UK strategy and prompted some research into tactical venting methods and by 1988 he was describing how such tactics might have been used to save several large structures that had recently incurred major financial losses where it was thought a lack of ventilation had contributed to such loss. He wrote – 'over the past four years I have attempted to educate and prompt discussion on the topic of tactical ventilation by firefighters in fire-involved structures' and acknowledged that the recent interest by a Chief Fire Officer (John Craig of Wiltshire) in the theory and practice of 'Tac-vent Ops' was a major step towards national acceptance. He was personally involved with CFO Craig and the Wiltshire Fire Brigade in writing the first UK SOP document (Operational Note) on Tactical & Positive Pressure Ventilation in 1989.

One of the most difficult decisions a fire commander, or firefighter acting under SOPs, must surely make, whilst on-scene in the early stages of a structure fire, is whether to ventilate or not? Is the best option to 'pop' that window? Cut into that roof? Open the skylights? The strategy of venting fire buildings has been approached from many angles. In the USA it has long been accepted that the most viable approach for firefighters is to 'open-up' the building at an early stage of fire operations in an attempt at relieving conditions for firefighters and trapped occupants within. It is also seen as a method of preventing various forms of *extreme fire behavior*, rapid fire progress etc as well as controlling spread as the fire so often *mushrooms* and travels horizontally through attics, voids and cocklofts.

In contrast, the European approach has generally viewed early venting actions as a strategy fraught with problems. The burning rate of the fire iincreases as additional air is allowed to flow into the building and this effect counters the low-flow attack hose-lines that have been widely popular. The European philosophy is often based around low-flow attack lines, working from engine tank supplies, speedily deployed into effectively compartmented structures. The US approach generally has to deal with a more rapid and active form of fire spread, from larger compartments, in timber-framed property. The fuel-loading of US properties may also be somewhat higher in comparison.

However, what was starkly obvious to me, as a firefighter serving on both sides of the Atlantic, was that US firefighters utilized tactical venting actions too often whilst European firefighters resorted to such tactics on too few occasions! It is clear that both approaches have resulted in causing fatalities of both trapped occupants and firefighters alike.

The introduction of Positive Pressure Attack (PPA) ventilation in the 1980s provided a means of ventilating fire buildings by forcing heat, smoke



A window venting action is modeled here and demonstrates at 2 seconds, a gravity current forming with air (blue) entering into an under-ventilated room. The red region represents a mix of fire gases that are too rich to ignite. The green region shows an area of danger as fire gases mix with incoming air to form a flammable layer

and fire gases to move ahead of advancing firefighters and exit the structure at a pre-determined point. This attack strategy is still strongly viewed as potentially ‘dangerous’ by many fire authorities whilst others are staunch supporters. It is often viewed as a *secondary* form of tactical ventilation, used by firefighters in areas of limited resources and reduced crewing.

In the 1980s the Swedish Fire Service began to pay closer attention to *fire dynamics* and researched how various *ventilation profiles* were likely to affect compartmental and structural firefighting. Their approach raised our awareness and it became clear that firefighters were regularly operating without any necessary fore-thought or knowledge of how fire gases form, transport and ignite, and to what effects varying ventilation parameters had on the outcome of any particular event. It is evident that firefighters and fire officers should therefore gain a practical understanding and full appreciation of how compartment fires are likely to behave before implementing tactical venting actions of any sort.

In general, the current European approach places the *stabilization of interior conditions* ahead of tactical venting actions as a primary tactic and utilizes *fire isolation, or confinement,* tactics as a priority. However, it is equally important to apply risk-assessed principles in the decision making process and recognize exactly when an early tactical venting action will be a safer or more productive option. There will be times where releasing combustion products from a compartment/structure will be far more beneficial to building occupants and firefighters than any fire isolating actions. I can remember situations where firefighters were unable to ascend stair-shafts to effect primary searches of the upper floors because the skylight over the stairs had not been opened to vent heat and smoke. On other occasions I can attest to playing ‘catch-up’ with the fire as it mushroomed and spread through roof voids etc. I can also describe situations where too much venting or misplaced venting actions caused the fire to spread out of control, endangering lives. A Swedish scientific research study suggested that fire officers should gain a clear understanding of how *pressure build-up* develops within a fire building and how gases flow out through various types of opening in different situations. The causes of such pressure build-up may be divided into a number of categories – Inhibited thermal expansion – the buoyancy of hot gases – normal temperature difference between inside and outside air – wind – mechanical ventilation. It is important also to appreciate how openings may become inlets (for air) as these internal pressures move nearer equilibrium with the outside pressure. Eventually, as smoke and fire gases begin to clear from the vented area, air will enter and mix with the remaining gases and may allow the fire to intensify. It is possible that some form of flashover or backdraft may occur at this stage.

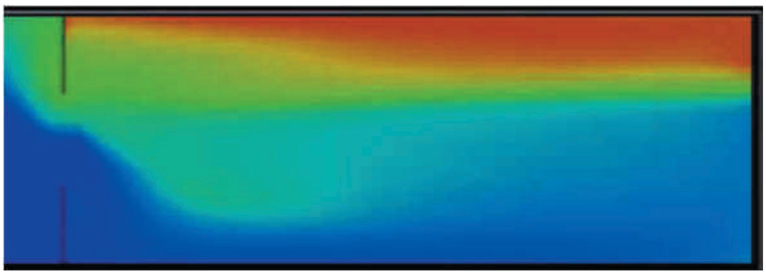
Tactical objectives

Any venting action demands fore-thought based on an intention – what is the objective? Venting actions should be based on the following three objectives –

1. Vent for Life.
2. Vent for the Fire.
3. Vent for Safety.

Venting for *life* situations recognizes SOPs where firefighters may create openings, or break windows, to gain access from an exterior position to carry out a primary search in a high-risk area of the structure. This may be bedrooms some way from the fire or it may be the area adjacent to the fire itself. This approach is often termed VES by firefighters (Vent – Enter – Search). It is a strategy that is often fraught with hazards but in turn, may reap great rewards for the search team. The venting and entry action, as with any tactical venting process, demands great *precision* (venting the correct windows); and *anticipation* of potential fire spread. Such an approach should also be *communicated* to the Incident Commander and also crews working on the interior where possible. The overall approach to venting should be carefully *coordinated* so that all affected parties are aware of what is taking place. Take note that the interior search should move from window to door and back to window and not into the corridor to any great extent, utilizing adjacent windows to repeat the access and search process. Openings are sometimes created above escape route stairways in medium-low-rise buildings to alleviate smoke conditions, enabling occupants to evacuate safely.

Venting for *fire* situations are often misapplied and careful thought should be given to the objective at hand. The main objective must be to improve interior conditions for firefighters by reducing heat levels and improving visibility. It is a common belief that windows should be vented in the area that firefighters are working – this is not so! The rule here is to vent windows ahead of the nozzle and near to the fire so that combustion products may be forced safely out of the structure.



Just 10 seconds after the venting action occurs and a clear flammable layer (green) exists near the ceiling but clear air is prominent in the lower regions of the room. This situation could possibly lead to a ‘rollover’ if there is an ignition source available

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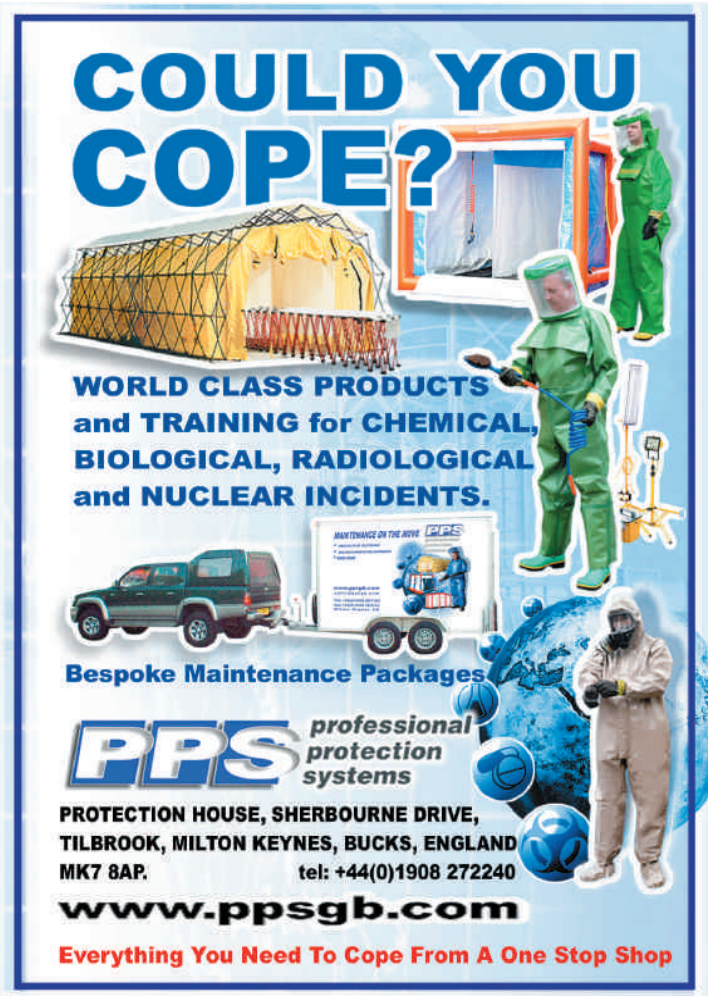

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Image: Martin Grant

It is a fact that most compartment fires are burning under *ventilation-controlled* conditions as firefighters advance in – the fire is searching for air. Any negative pressure conditions created (ie; a vented window) will draw the fire towards the new air supply and if this behind or adjacent to the hose-crew then that cannot be a good thing. Also, this addition of air will cause the fire to achieve a greater rate-of-burn, increasing its *heat-release-rate*; it may actually become hotter! Therefore it is essential that firefighters crewing the hose-line have adequate flow at the nozzle to deal with any escalation of the fire. Finally, pay close attention to wind force and direction prior to creating an opening. An opening on the windward side of the structure, in particular, may cause the fire to head rapidly in the direction of advancing firefighters!

Venting for *safety* is reserved for situations where fires are burning in an *under-ventilated* state. The fire may be developing slowly, due to a 'sealed' structure or compartment, presenting a heavy (probably hot) smoke build-up within a confined space. In this situation careful attention must be paid to door-entry procedures and it may well be a viable action to vent a compartment from the exterior prior to gaining entry.

The decision to create openings within a fire involved structure to gain tactical advantage should be carefully considered for the outcome may be irreversible. Under certain circumstances such actions may prove most effective whilst in others they may prove disastrous. In some situations the openings will serve to release combustion products whilst others may simply provide dangerous airflows heading in towards the fire. It is often the case that the most influential (dangerous) opening a firefighter can make is at the point of entry to the structure. This opening is often seen as a necessity and is not considered as part of the venting plan. However, the airflow provided at this point of entry may serve to intensify the fire and may indeed allow it to escalate beyond the capability of initial attack hose-lines.

Tactical openings made to release combustion products may serve to reduce smoke-logging, lower compartmental temperatures, prevent flashovers and backdrafts and generally ease the firefighting operation. However, it is also possible that such openings may achieve undesirable and opposing effects, causing temperatures to rise with resulting escalations in fire spread leading to flashovers, backdrafts and smoke explosions.

Window venting actions – safe or not?

Whenever a window is breached by firefighters the immediate result will generally be to clear some combustion products from inside the room served by the opening. This is likely to raise the smoke interface away from the floor, particularly near the window itself. There will also be an inflow of air into the room and this may be positive or negative. Such an airflow may serve to assist trapped occupants to breathe but it may also cause a fire to increase in intensity. Such an airflow into the opening could possibly cause either of two unwanted events – a backdraft or a flashover (*there is potential of a 'flashover' being induced by an increase in compartmental ventilation where the heat loss rate increases as more heat is convected through the opening. However, there is a point beyond stability where ventilation may cause more energy to be released in the compartment than can be lost and this condition of 'thermal runaway' may lead to 'flashover'*). Additionally, the movement of combustion products through the opening may create a reduction in room pressure that actually 'pulls' heat and smoke, and possibly fire itself, from adjacent areas. In general, there is usually a brief improvement in local conditions in the vicinity of the window but this may only be temporary. The conditions elsewhere in the structure may worsen because of this venting action.

The hazards associated with initiating *rapid decompression* in a fire-involved structure exist and may have dramatic influences on fire spread and extreme fire behavior. In the January 2000 edition of Fire Engineering magazine Brian White, a Captain with FDNY, put forward his own theory of a phenomena he termed – **high-pressure backdraft**. It was Mr. White's belief that wind effects upon buildings sometimes created excessive pressures to form within, as air entered through various openings on the windward side of a structure. He further suggested that when an opening was created elsewhere in the structure, the sudden unleashing of pent- up pressure sometimes worsened the effects of any rapid fire development as it stirred a large mass of high-velocity air-movement through the structure. He described several scenarios where rapid decompression of a structure occurred as windows failed, or vented, causing major increases in the burning-rate that were greater than normally anticipated '*fanning' effects* created by wind movement alone. I have also written extensively on this phenomenon since 1992 (Fog Attack), suggesting that great forces of *momentum and inertia* may be created by *negative pressures* that develop within structures during fire situations. One such example is related to the negative pressure that often exists *behind* firefighters as they advance into a fire involved floor of a high-rise structure causing the fire to be 'sucked' out of the apartment or floor to head directly into the stair-shaft. This negative pressure may be substantial and is a by-product of natural stack effects in the stairway itself. On occasions this effect can cause a negative pressure in the fire area itself to cause outside windows to break inwards, allowing exterior winds to intensify fire conditions.

At a high-rise apartment fire in Houston, Texas where a Fire Captain was killed in 2001, it was reported –

'They exited the apartment and headed down the hall, but a nasty thing happened when they opened the stairwell door, sources say. The stairwell acted like a ferocious maw, sucking heat and smoke down from the burning apartment. For Jahnke and Green the effect was overwhelming. The smoke grew thick as a blindfold; a torrent of hot air whirred past. The captains reportedly tried to beat a retreat by following their hose out of the apartment and down the hallway, a task made brutally complicated by the coiled, irregular pathway of their lifeline.

The violent shift in the air current created high confusion by sucking the heat away from the fire. To Jahnke it seemed as if they were headed toward the fire, not away from it, as they followed the path of the hose, Hauck says' . . .

In July 1990 FDNY firefighters experienced similar effects when a fire on the 51st floor of the Empire State building created a reversal of smoke

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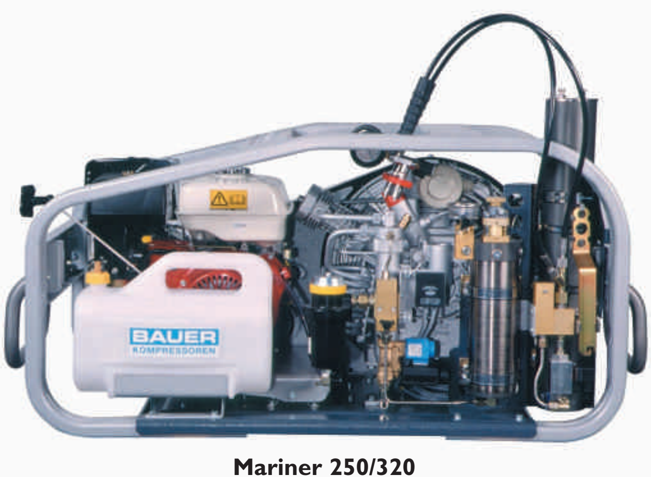
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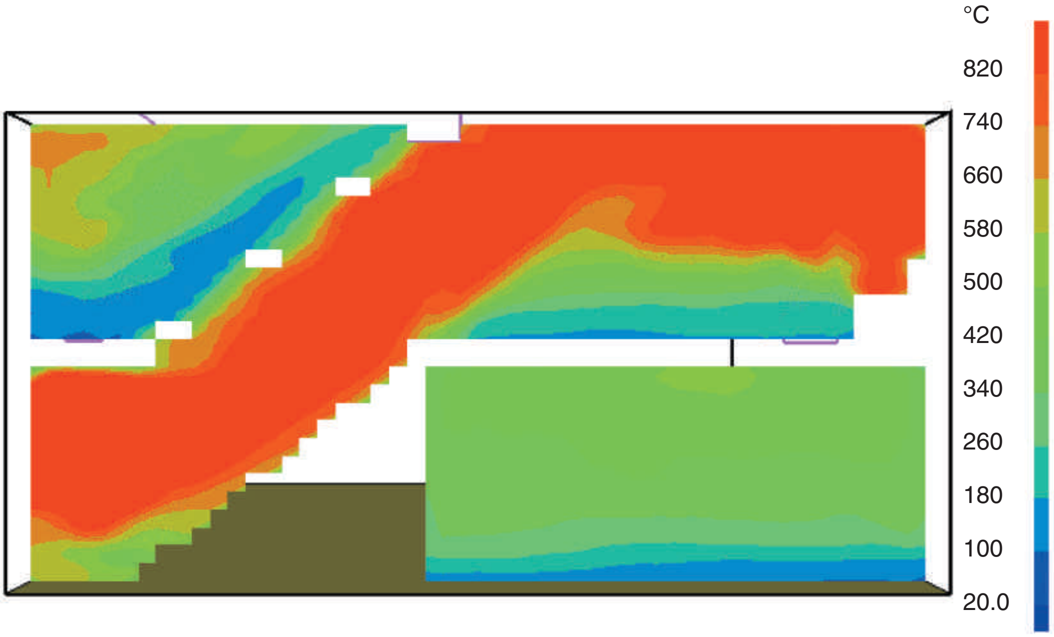
The venting action at the DCFD Cherry Road fire demonstrates this hazard



and super-heated fire gases as firefighters approached from the *vented* fire-tower stairs. The natural stack effect in the stairway, coupled with an exterior wind estimated to be gusting to 60 mph, caused the outside windows to fail with a subsequent reversal of fire, heat and smoke into the stairs behind the advancing firefighters.

In 1988 a team of firefighters in London were caught as they approached a high-rise fire from the stair-shaft. As firefighters began to attack the fire in a five-roomed apartment on the 16th floor the opening of two stairway lobby doors on the fire floor allowed the negative pressure to reverse flows, drawing superheated gases and fire into the stairway. The fire extended three levels above and two levels below the fire floor in the stairway! Several firefighters were burned. During the mid-1980s another fire in the UK took a firefighter's life under extremely similar circumstances as midlands firefighters battled a high-rise blaze.

On December 18, 1998, tragedy struck the NYC Fire Department a mere 7 days before Christmas claiming the lives of 3 fire fighters. At 0454 hours Brooklyn transmitted box 4080 for a top floor fire at 17 Vandalia Avenue in the Starrett City development complex. The sprawling complex is located on Brooklyn's south shore in the Spring Creek section. The 10 story 50 x 200 fireproof building is used as a senior citizen's residence. 'As the Lieutenant and fire fighters arrived at the door, a sudden change in the wind direction forced an estimated 29- MPH wind gust into the apartment, and a 2,000 degree fireball into the hallway'.

With the memory of 3 fire fighter's funerals fresh in their minds, NYC's Bravest were called upon yet again to battle a 4 alarm hi-rise fire in the posh Upper West Side of Manhattan. This time, 4 civilians were to lose their lives. In a virtual repeat of the fire that killed 3 fire fighters 5 days prior, the hallway and stairwell were converted into a 2000-degree smokestack. Within minutes fire was showing through the 19th floor apartment's windows; clouds of black smoke billowed up along the buildings 51-story facade. Unlike the fire on Vandalia Avenue, this building was not required to have sprinklers in the hallways, only a firehose and standpipe in the stairwell. Many residents on the upper floors were lucky in their attempt to leave the building. They took the stairway early enough to avoid being disabled by smoke and heat. But for 4 others the timing just wasn't right. Between the 27th and 29th floor, 4 people died of smoke inhalation.

In 2001 several tower occupants were rescued from the roof of a UK high-rise fire as the fire was reportedly 'sucked' out of an apartment and into the stair-shaft, causing firefighters to retreat and re-group.

However, if crews are advancing a hose-line into a room where there is fire then such an outlet will generally serve to assist their advancement by removing heat and steam to the exterior. A recent research project carried out by Swedish scientists demonstrated the likely effects of a localized window venting action.

A situation has been noted where venting actions have often resulted in devastating effects. Some buildings are designed with a normal point of entry through the front at ground floor level, whilst having the rear basement spilt-leveled so that it too appears at ground level from the rear of the structure. Where initial openings made at ground level (front) for entry are followed by venting (or further entry) actions at the rear basement level, rapid fire propagation has often occurred. Usually, this situation occurs whilst firefighters are occupying the space.

It is always essential to consider the wind direction and any effects this is likely to have on fire spread. This is particularly important where wind is entering the point of entry – such an effect may be either useful or hazardous to interior firefighting crews advancing on the fire. A further situation that may lead to unfavorable conditions could occur where ventilation openings are made in a room *adjacent* to the fire compartment. Where airflows are set up through the fire compartment itself the conditions may improve but where the natural path of ventilation is through a room adjacent, temperatures and smoke-logging may actually increase throughout both compartments.

Remember – in any situation, what is your *objective* in creating an opening? Temporary relief may occur at the point of opening but if such a venting point is not ahead of an advancing hose-crew – think twice? If it is a point of entry you are creating then risk-assess the situation and again apply the *objective* test – is there a better point of entry? What will be achieved in creating this opening?

Roof Ventilation – A Viable Option?

Battalion Chief Frank Montana (FDNY) describes how tactical venting actions on roofs should be approached –

In NYC we do not vent peaked roof private dwellings in the early stages of the fire. We, instead use our available manpower to aggressively attack the fire and to simultaneously initiate an interior search both on the fire floor and above the fire. If needed, later arriving units will open the roof. On a flat wood joist roof private dwelling, we would initiate roof ventilation early in the operation because venting the roof will greatly improve interior conditions and allow aggressive interior attack as well as search. For multiple dwellings, we would quickly open the stair bulkhead and skylight. This prevents fire mushrooming and allows for victim survival as well as an aggressive interior attack and search. If the fire was on the top floor of a wood joist roof, we would cut over the fire area to prevent fire spread in the cockloft. If the fire were spreading in the cockloft, we might try a trench cut along with positioning lines to stop the fire. On commercial buildings, with metal deck roofs and metal bar joist supports, there is usually not much point to cutting the roof. We would just open any existing openings like skylights and try and vent horizontally. The hazards of cutting these roofs usually outweigh the benefits. The same goes for poured or plank gypsum board roof. We don't cut them. They are too hazardous. We have lightweight wood truss floor beams and roof beams and light weight metal C joists to deal with now. The lightweight wood truss fails without warning early in a fire and the C joist turns to limp spaghetti when exposed to the fires heat. Cutting roofs supported by these joists is not a great idea. The problem is that often, we are unaware that they are present. There is no warning sign that lightweight metal or wood truss or c joists are in place. The first indication of their presence may be discovered when the roof man cuts the roof or when the roof or floor collapses. We try to identify these buildings and put them into the dispatch info transmitted when we are notified to respond. Then there is the problem presented by membrane roof covering with its fast spread. (Fire-fighters have been chased off of these roofs by fast spreading fire.) In addition, depending on the type, it is sometimes difficulty to cut. As you might imagine, we don.t cut many concrete roofs. For our buildings, with our types of construction and using our aggressive interior attack and search tactics, roof ventilation makes good sense in many instances. It is dangerous as is entering a building without a hose line to search, but the rewards are often great. (Saving life) The roof man should be an experienced and well trained firefighter.

Positive Pressure Ventilation – PPV

As a post fire strategy the use of Positive Pressure Ventilation (PPV) by trained and experienced operators is generally proven to safely and effectively remove smoke and dangerous gases from within the fire compartment and structure, enabling firefighters to complete overhaul and mop-up operations with ease. When used to force-vent a structure/compartment during the actual fire attack stage PPV has been found to relieve conditions for firefighters; improve visibility; remove smoke and dangerous gases quickly and effectively and reduce temperatures within the structure. However, such use of PPV demands a more intensive level of training and a comprehensive understanding of fire behaviour, air dynamics and fire gas transport within a structure. Before using PPV during the *attack* stages of a fire it is imperative to know where the fire is located; to what stage the burning regime has developed and if the fire compartment is in an *under-ventilated* state.

Where the fire exists in an under-ventilated state or where any warning signs preceding backdraught are apparent then PPV should not be used if the structure is likely to remain occupied. It is well established that the addition of air into an under-ventilated compartment could possibly trigger a *backdraft*, *smoke explosion* or even a *flashfire*. If the fire has reached a ventilation-controlled regime, with steady-state burning, it may be safe to initiate PPV but firefighters should be aware that the air-flow from the fan/s could still possibly create a build-up of dangerous gases or combustion products within compartments. This could occur as super-heated wall and ceiling linings and hot embers/'bulls-eyes' combine in the increased air-flow to form a hazardous environment. Also, firefighters should gain an understanding of how air-dynamics in stair-shafts and corridors could potentially create negative pressures that may actually 'pull' fire, smoke and gases into such areas. The potential for fire spread into other areas where elements of structure have been breached always remains a concern and PPV should be used in association with firefighters operating thermal image cameras (TICs) to monitor any such fire spread into internal shafts or roof voids. The siting of adequately sized smoke outlet points is of course a major factor of any successful PPV operation.

A more recent adaptation of Positive Pressure Attack has seen firefighters use isolation tactics inline with PPV. This entails *'safe-zoning'* areas by confining the fire and venting dangerous gas formations in adjacent compartments from the structure prior to opening and entering the fire compartment itself. For example, where a crew advances in and locates a well advanced room fire behind a closed door they may decide to ventilate the structure, using PPV, and clear any gases prior to entering the room for fire suppression.

Tactical ventilation or fire isolation tactics? – two options that both offer major benefits to the firefighter. The choice in any situation is down to careful risk-assessment by *balancing potential risks versus likely gains and applying the 'objectives' test as described above*. In some situations an early venting action relies heavily on adequate resources, equipment and manpower on-scene to ensure a safe and effective outcome. To be in a position to operate effectively there must be a pre-plan that is documented by SOPs and firefighters must have early and safe access to roofs, in the form of aerial appliances. Where cutting tools and power saws are not available it may still be possible to utilize existing openings, skylights over stair-shafts etc, to ventilate effectively for Life. **APF**

Paul Grimwood served 26 years as a professional firefighter, mostly within the busy inner-city area of London's west-end. He has also served in the West Midlands and Merseyside Brigades as well as lengthy study detachments to the fire departments of New York City, Boston, Chicago, Los Angeles, San Francisco, Las Vegas, Phoenix, Miami, Dallas, Metro Dade Florida, Seattle, Paris, Valencia, Stockholm and Amsterdam. During the mid 1970s he served as a Long Island volunteer firefighter in New York State USA. He has four books in six languages and over 100 technical papers on firefighting strategy published. He can be reached at www.firetactics.com

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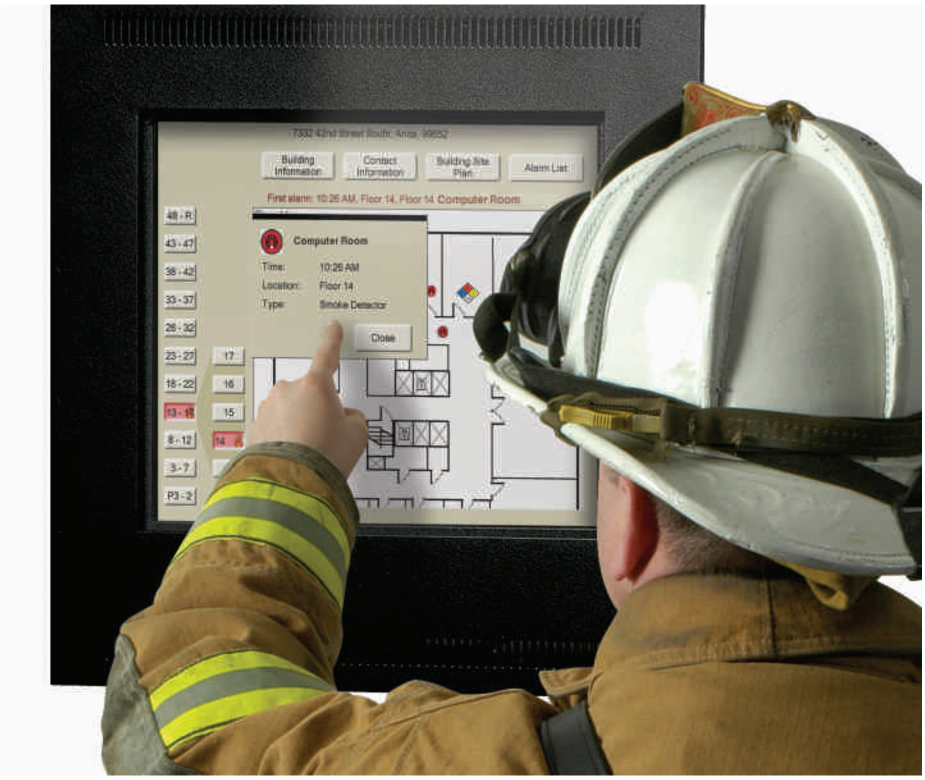


Figure 1 (Firefighter using FirstVision)

Evolution of Fire Alarm Technology:

Interactive Firefighter's Display

By Peter J. Ebersold and Trista A. Budd

Honeywell Fire Systems Group

Envision a fire department responding to a fire alarm in the middle of the night. The facility is primarily occupied during the day, like an office building, shopping mall or industrial plant. There is no visible smoke. This building – like many others around the world – has no trained security force patrolling it, no bank of CCTV monitors being carefully watched for any sign of trouble. Then an alarm from the fire control panel alerts the local fire department to a potential fire situation.

This happens everyday to firefighters around the world. When the firefighters arrive and enter the building, they have many crucial questions:

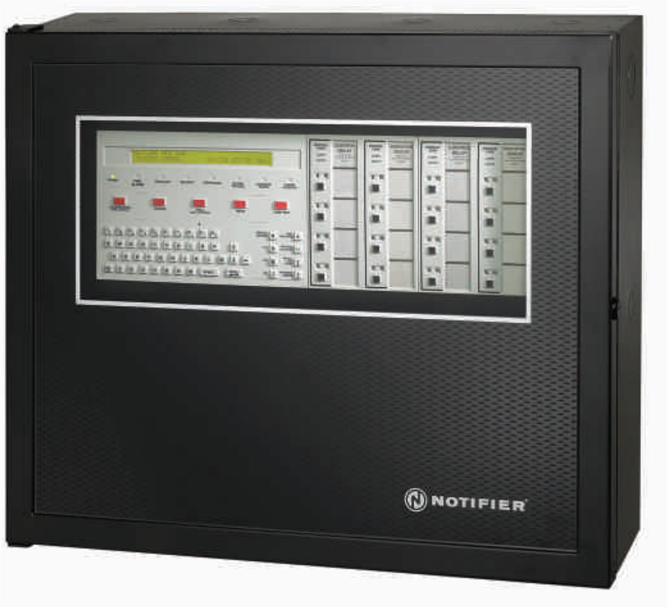
- Where is the emergency?
- Is it an actual fire event and if so, where did it start?
- How long has it been burning and which way is it spreading?
- What's the fastest way to reach people in need of aid?
- Are there any internal structural or chemical hazards?

Revolutionary Firefighter Tool

When firefighters arrive on the scene of a building fire emergency, they first must gather information to accurately assess the situation. Speed of assessment is critical. The more rapidly the origin of the fire and its progression is identified, the more effectively resources can be deployed on the fire scene. Increased speed and accuracy of response result in the potential reduction in loss of property and life.

Using a new interactive wayfinding technology, firefighters receive answers to critical questions quickly and reliably. This revolutionary touch-screen PC for firefighters simplifies emergency scene assessment by pinpointing the origin and migration of a fire. The display is installed in a building lobby or main entrance to a facility. This breakthrough technology gives first responders the ability to access the information they need to perform their jobs safely, effectively and efficiently. Firefighters now have an additional tool to fight a fire, potentially reducing property loss and

Figure 2



improving life safety for building occupants and the firefighters themselves.

The new interactive firefighter's display is housed in a rugged wall mounted box to be installed in a building's lobby or common area. The display is powered by a 24 volt power supply with battery backup. The box is locked during normal conditions and unlocks automatically once the fire alarm system is activated. The touch screen is driven by the fire alarm system. Multiple displays can be installed in any facility. For example, in sprawling industrial complexes, a touch screen display can be positioned at every major facility entrance. The display units operate separately, so unique information can be viewed on different units simultaneously.

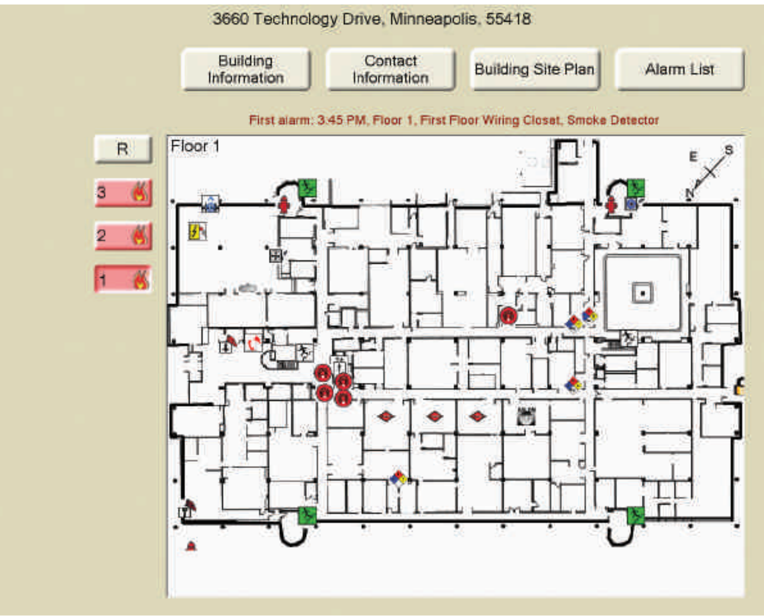
Fire Alarm System Evolution

Fire alarm life safety systems have been moving towards more intelligence for quite some time. The dramatic shift in demand from conventional to addressable systems was driven by the need to more accurately identify the origin of a fire alarm. Addressable systems have the ability to pinpoint the origin of an alarm, whether it is an automated fire detection device such as a smoke or heat detector or a manually operated device such as a pull station. Modern addressable fire systems not only have the ability to display a description of the location but also the ability to crudely communicate the spread of the fire. The new interactive firefighters display is the next evolutionary step in intelligent fire systems.

Addressable fire alarm control panels (FACPs) were one of the first steps to assist in pinpointing the origin of a fire. With features such as custom labels, the FACP can display an alphanumeric description of the location of an activated detector(s). This custom label information is most useful to someone who is familiar with the layout of a building such as a facility manager or maintenance personnel. Since many life safety emergencies can occur after normal working hours, building personnel may not always be on site to assist firefighters in locating a fire. The new wayfinding technology gives firefighters timely information on the origin and spread of a fire within a structure whose layout they are not likely to be familiar with.

Today, current fire alarm control panels (FACPs) and annunciation technologies in commercial buildings are a primary source of alarm information for firefighters arriving on the scene. This is particularly true at night when building occupants are not there to report their observations. Current fire alarm control panels and traditional annunciators indicate only the devices that are in alarm (See Figure 2). This sensor/detector information is given in a rather austere form. Typically, the fire panels presents activated smoke/heat detectors as items in an alphanumeric list, each activated detector described by an alphanumeric location code, and an activation time.

In order to interpret the data the firefighter must perform two tasks. First, they must translate the alphanumeric location code for each detector in the series to a location in the building. Second, in order to understand the time sequence in which the detectors were activated and hence, assess the speed of fire propagation, they must read through the times in the alphanumeric detector list and create a mental timeline. To understand both the speed and direction of fire propagation, the firefighter must do both of these simultaneously. In contrast, the firefighter display saves crucial assessment time by providing a spatial, graphical depiction of the location of activated detectors in the building and a graphical visualization of the time sequence of detector activations.



3660 Technology Drive, Minneapolis, 55418

First alarm: 3:45 PM, Floor 1, First Floor Wiring Closet, Smoke Detector

Figure 3

But with this new wayfinding technology, firefighters are no longer limited to fire alarm information only. Now they have the power to see virtually everything within the building that can help or hinder their response. In addition to these two major features, the display also support firefighter situation assessment by providing easy access to graphical, spatial information on the location of water supplies, evacuation routes, access routes and points, fire barriers, gas, power, and HVAC shutoffs, and chemical and structural hazards present in the building.

Designed by Firefighters, For Firefighters

When a firefighter arrives on the scene, the time required for scene size-up must be minimized while the amount of information gathered must be maximized. As a result of thorough research and extensive interviews with senior level professional firefighters, the new interactive display was developed to provide critical answers in 30-60 seconds. The display is so intuitive to use that no special training is required. Firefighters can quickly obtain crucial information about a building emergency that is easy to interpret with a spatial, graphical depiction of the location and sequence of detector activation.

When a firefighter first approaches the display, the default screen graphically identifies where active detectors are located in a structure overlaid on the building floor plan. The active detector icons flash in sequence of activation to clearly indicate fire origin and the direction which it is spreading. By selecting the active detector icon, the firefighter learns the device details and how long it has been active. On the first screen the responder has an overview of the entire building, viewing crucial data such as the number and location of all entrances and exits, offices/ rooms and wall locations. Any hazardous materials in the facility are also immediately apparent with HazMat icons overlaid on the floor plan (See Figure 3).

Firefighters have a choice of which information to access, based on what type of emergency is occurring and what their experience tells them they need to know quickly. The large display and clearly labeled icons makes it easy for fire fighters to touch the screen and gather critical event information even while wearing thick gloves. Each screen gives maximum information with minimal navigation. In fact the user is never more than one screen away from the information they need.

And finally, all the icons used are industry standard and instantly recognizable to virtually all first response personnel. If the building is part of a new development, or if the first responder is not completely familiar with the area in which the building is located, he or she can access a site plan that shows the building's geographical location and position in relation to surrounding streets, landmarks, or other buildings. And first responders no longer need to search for emergency contact names or other important phone numbers. All this information is displayed on the contact list, which is clearly marked on the interactive touch-screen.

Applications/Typical Installations

Because the interactive display is designed to speed up and clarify the decision making process for firefighters, the more complex the decision making process, the more valuable the system. Therefore, the system is most important to larger buildings and larger complexes/campuses.

One of the first installations of this new technology is in a science building of a university in the United States. The complex layout of the laboratory facility and the numerous hazardous materials used and stored in the laboratories make the interactive display valuable. Some other key applications are outlined in Figure 4.

Conclusion

The new firefighter's interactive display takes the information available to responding fire companies to the next level and increases the value of the fire alarm system in planning an attack on a fire. Ultimately, this new wayfinding technology assists firefighters in what they do best: evacuate the building, locate the seat of the fire and extinguish it to stop further property loss. **APF**

Facility Type	Why Use Wayfinding Technology?	Examples
Medium to Larger Size Buildings & Complexes	Fighting fires in larger facilities tends to be more complicated with involved building layouts	● large distribution centers ● assembly plants
High Value Buildings	Buildings occupied by a large number of people or contain extremely valuable property need fire response personnel immediately directed to the event location.	● hospitals ● museums and galleries ● high rise office or residential properties ● sports arenas ● concert halls
High Risk Buildings	When buildings have high risk and/or hazardous materials, wayfinding technology clearly shows the location of these materials on the building layout. By selecting the HazMat icon, the first responder can learn important details about the material and appropriate fire suppression technique.	● petrochemical plants ● munitions manufacturing ● data storage ● archival storage facilities ● laboratory facilities (commercial, education, forensic)
High Visibility	Businesses that can gain increased security by including wayfinding technology in the fire and life safety system.	● luxury hospitality ● high rise condominiums ● shopping malls ● premium office space

Figure 4

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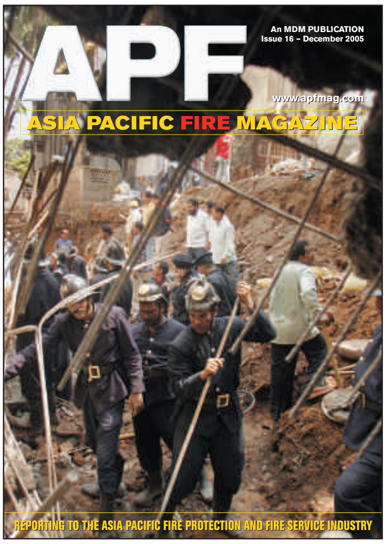
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Think of a location that needs to be defended against fire. Chances are products from the Fire Suppression Group of Tyco Fire & Security are on the job. How is that possible? By maintaining a presence on every continent of the globe. And with the world's leading fire suppression brands, including ANSUL®, HYGOOD™ and NIEDNER®, it's no wonder we're our customers' most complete source of answers.

Tyco Fire Suppression Group. The fire protection people always right where you need them to be. Near.

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Ergonomic Designs that reduce coat rise, ensuring lower torso protection while at the same time permitting a shorter cut for better mobility.

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Built to meet and exceed **EN 469** Standards

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